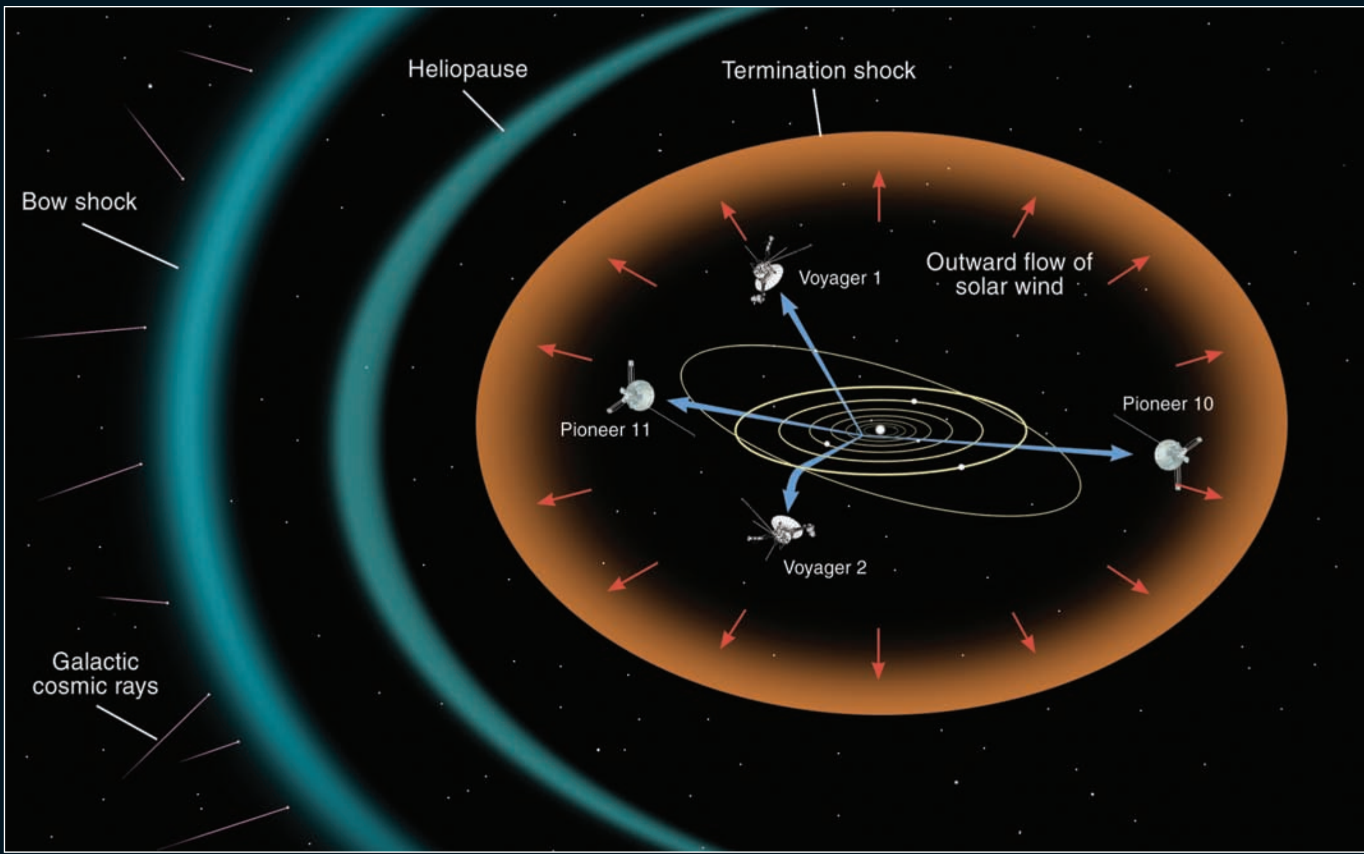
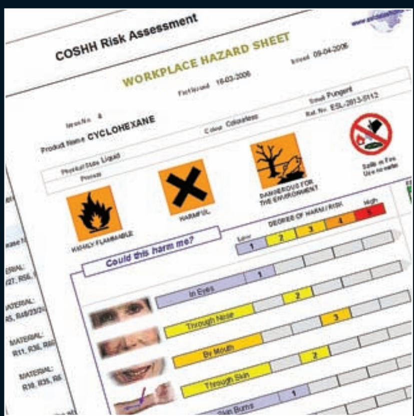
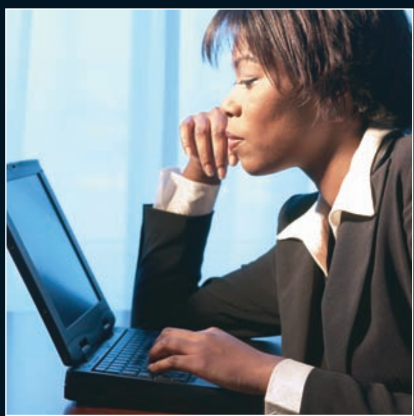
The Institute of Science & Technology

The Journal

Autumn 2007







The Official Journal of The Institute of Science & Technology -
The Professional Body for Specialist, Technical and Managerial Staff

The Journal

The Official Publication of The Institute of Science & Technology

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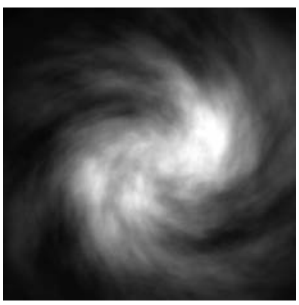


Editorial

Ian Gray

Are meetings really necessary? People all over the world attend meetings covering a huge host of issues, hopefully thereby gaining value and experience from them.

I missed my first IST AGM this year through an unfortunate set of circumstances and felt saddened I had not only failed to make contact with personal and professional friends but that I was unable to hear other views and contribute my own to shape the future Institute. I recently attended the EGM, an historic one for the IST because of the import of the name change to secure a national training initiative (details within this journal), to discover many new young members being involved and hope they will use their voices to guide and strengthen the new directions the IST is following.

What happens if you do not attend a meeting? A number of years ago the budget had to be revised and the chair did not attend on his committee date and found afterwards that his budget was withdrawn and the committee disbanded! One wonders whether his attendance might have forestalled such an action.

What happens if others do not attend meetings?

I am reminded of an occasion during the traumatic period of the English Enclosure Act of the 19th century when a parliamentarian happened to be passing a room, where a meeting was being held, and heard mention of a hanging offence. On further enquiry he established that the Act was causing strong reaction in the countryside and the sub-committee had been set up to "deal with the respectful disturbances against the Act", which was causing the upper ruling class "concern". This sub-committee discussed the issue and decided hanging to be a useful deterrent, which was unanimously voted by those present and subsequently accepted by parliament as an extra clause to the Act. The people in the room consisted of the speaker and a clerk, who took down details of "the discussion and voting"!

If you sit on a committee, or are invited onto one, not only do you continue to learn valuable lessons from other more senior members, which are easily transferable to your professional career, but you gain a confidence and ability to project your thoughts into actions which most often bear considerable fruit.

At the moment positions are becoming available for the Executive of the IST, who can co-opt willing volunteers if they find the challenge of immediate appointment daunting. And meetings can be fun!

Sad news

Ron Dow

It is with great sadness that we report the death of our Vice President Ron Dow; the longest serving Chairman of the Institute and an active member for over 50 years. We will no doubt have our own personal memories of Ron but in the next Journal there will be an obituary so that we can share the recollections of others who knew him well.

John Robinson, Chairman

Letter to the Editor

Dear Editor,

In the June 2007 journal I read the article about the CPD programme IST runs for its membership. Interestingly enough, I have just finished a double CPD (Certificate of Professional Development) in Astronomy with the Astrophysics Research Institute, Liverpool John Moores University, with the chance of obtaining a distinction award in the process. I already have a CPD in Cosmology from Liverpool John Moores University and have applied to start another CPD in July 2007. I also plan to study a University Certificate in Astrobiology with the University of Central Lancashire starting in October.

These University CPDs are worth 12 credits each and the University Certificate is worth 20 credits, they can be used towards the Certificate of Higher Education (Cert.H.E.), Diploma of Higher Education (Dip.H.E.) or Bachelor of Science Honours Degree (BSc Hons) in Astronomy.

There is an Astronomy consortium consisting of the University of Central Lancashire, Liverpool John Moores University, Manchester University (with Jodrell Bank Observatory) and the Open University. They use Distance Learning part-time students to study modular accredited programmes towards University Certificates and CPDs.

Also, the Institute of Mathematics and its Applications (Royal Chartered) demands its membership and fellowship follow the CPD (Continuing Professional Development) path as part of their chartered status. The CMath (Chartered Mathematician) and CSci (Chartered Scientist) designations are validated by continual CPD updating.

Therefore it seems that CPDs are now becoming the essential standard in professional upgrading for Institutional membership and Higher Education. I would recommend and encourage more people to try this type of study to gain professional and achievable qualifications.

Kind regards,

Colin Neve, MIScT

IMPORTANT NOTICE

OUR NEW ADDRESS IS

Institute of Science & Technology
Kingfisher House
90 Rockingham Street
Sheffield S1 4EB

Tel: 0114 276 3197
Email: office@istonline.org.uk

Communicating Chemical Hazards in the Workplace

Environmental Science Ltd

Staggering figures released by the Health and Safety Executive indicate that:

- each year some 6000 people die from some form of cancer (including asbestos-related cancers),
- in 2005 – 2006, in the order of 156 000 cases of work-related breathing and lung problems were reported,
- around 27 000 people suffer from work-related skin diseases and this figure increases by about 3 000 per year.

A contributory factor is exposure to chemicals.

So what can be done about improving this situation?
A good starting point must be the identification of substances that could produce these ill effects and the subsequent communication of these facts within the workplace so that effective measures can be implemented to protect employees, and others, from harm.

About ESL (Environmental Science Limited)
The Environmental Science Group draws on the expertise of a team of dedicated consultants to provide a wide range of professional services which can help organisations meet the ever more demanding requirements of health and safety legislation. All the consultants are specialists, with in-depth knowledge and many years of experience in achieving practical solutions which not only satisfy legal requirements but which are realistic and beneficial for the organisations concerned. Many large organisations use our services but the Group also specialises in tailoring its services to the needs of smaller companies.

Core activities include production of Safety Data Sheets and development of software to facilitate management of chemicals and health and safety within the workplace.

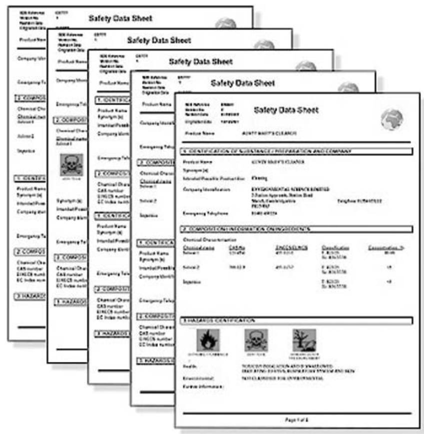
The Safety Data Sheet and Product Labelling Information
The standard method of chemical hazard communication has been the Safety Data Sheet and labelling information found on product containers. However, experience has shown that these have not always been effective for the following reasons:

- Safety Data Sheets are written in response to legislative requirements. Technical terms used are often quite involved and lengthy, due to the regulatory nature of the documents.
- Often, due to the technical nature of the information, it is not freely available to the workforce. Therefore, the information might go into a file or even get lost.
- The 16 sections of a Safety Data sheet are normally printed on a number of A4 pages. This can make it unwieldy in the workplace, especially where more than one chemical product and its associated data sheets have to be consulted.

Product labels are a primary source of useful information, especially if they are of sufficient size to be read and are not dismissed with other general labelling. However, there is always the risk that the product contents could be decanted into another unlabelled container.

A further problem arises when people do not read the data provided, even if it affects their own safety. This is often because too many intended beneficiaries lack the capability to understand and make use of the information. Simply increasing the quantity of information often makes it more difficult to identify useful details and oversupply can lead to cognitive overload. It is not a question of how much information people need to make them aware of hazards, but rather of selecting and conveying salient information that will be processed and utilised, i.e. information should be simplified and focused. The problem is exacerbated when English is not a person's first language.

Alternative Solutions from ESL
Following many years' experience creating Safety Data Sheets and undertaking COSHH assessments for companies, ESL is well aware of the difficulties in communicating information about chemical hazards and emergency actions in the event of exposure to them.



About 4 years ago, one of the senior consultants proposed the idea for a one-page hazard sheet based on colour-coding and images, keeping the use of the written word to a minimum. He recognised that making use of symbols and pictograms can increase comprehension, especially for non-English-speaking employees. A set of rules was developed to enable the level of hazard for each route of exposure to be evaluated, based on information supplied by the Safety Data Sheet. Flammability and environmental hazard were also included. After much deliberation and refinement, the WASPS software was launched.

WASPS (Workplace Activity Safety Protection Sheet)
Intended as a step in effective chemical hazard communication, this single page document can be displayed in the immediate work area. This enables users of chemicals to be aware immediately of the hazards associated with a given material. The use of these sheets in the workplace will also highlight management's commitment to employee safety. Whilst the Safety Data Sheet can never be replaced entirely by WASPS, the largely graphical summary provides operational staff with simple and continuous reminders of potential dangers from a substance, such as inhalation, skin contact, etc. Also included are emergency actions or procedures, in a simple-to-understand format.

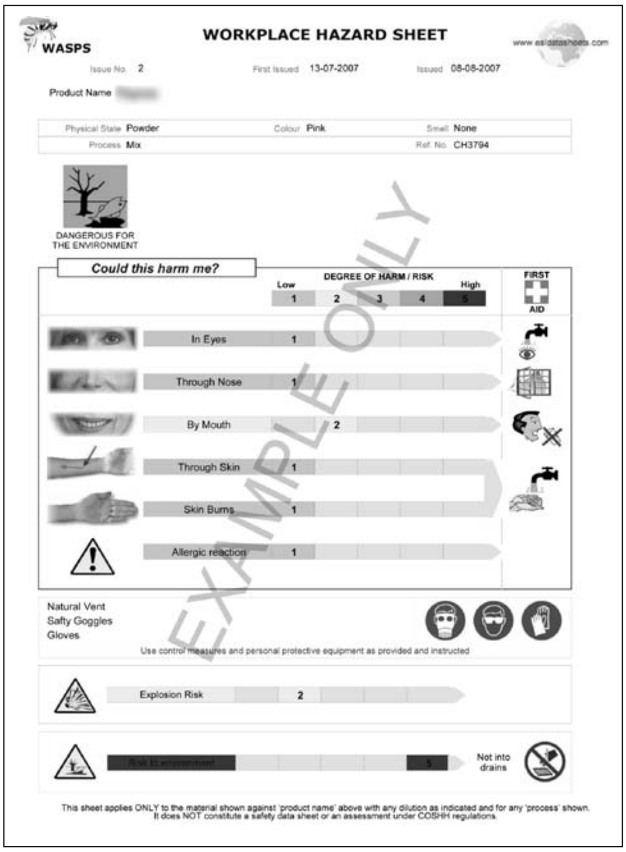
Therefore, WASP Sheets fulfil the criteria for effective communication:

- simplified
- focused
- in concise language
- using consistent and appropriate vocabulary,

and will also facilitate compliance with the REACH Regulation's objective to improve the flow of information to downstream users.

WASPS software is available with a library of 1300 pre-written WASPS for many common chemicals. These are split into two categories - single chemicals and substances and proprietary or generic products including many industrial products. These pre-written sheets are easily customised to any company preferences and include the facility for custom graphics and ratings. These new WASPS may then be saved in the company's own library.

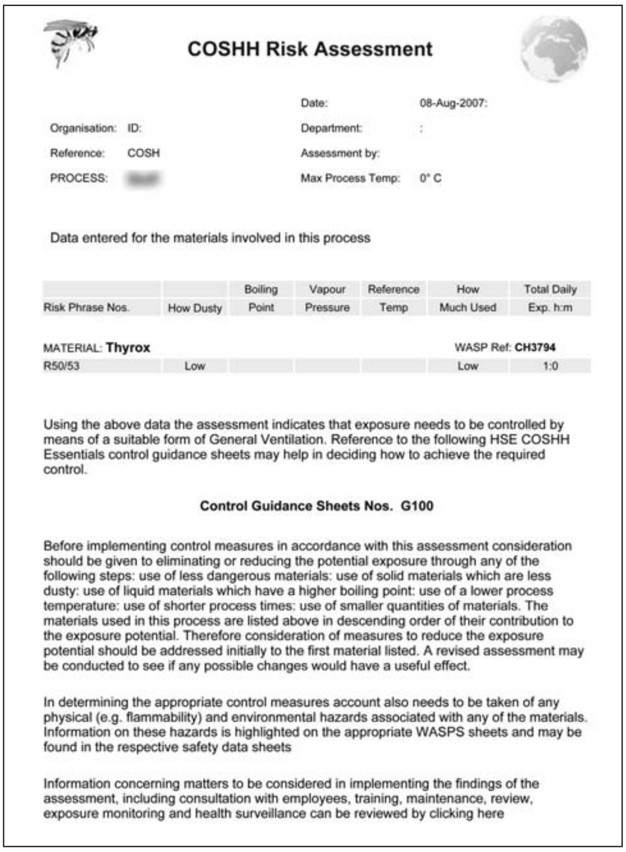
Example of a WASP Sheet



WASPS software also offers the facility to use the WASP to carry out straightforward COSHH assessments based on the Health & Safety Executive's COSHH Essentials techniques. Advice on the interpretation of the results is available as is reference to the HSE's Guidance Sheets. COSHH Reports produced by the software contain hypertext links directly to these sheets.

New WASPS can be created, in as little as five minutes, using information from a Safety Data Sheet, e.g. physical state, Risk phrase/s, combustibility, environmental effects. Slightly more information from the SDS is needed to begin the COSHH assessment, together with information from the workplace about the way in which the substance is used.

Example of a COSSH Sheet



COSHH Risk Assessment

Date: 08-Aug-2007:

Organisation: ID:
Department: :

Reference: COSH
Assessment by:

PROCESS:
Max Process Temp: 0° C

Data entered for the materials involved in this process

Risk Phrase Nos.	How Dusty	Boiling Point	Vapour Pressure	Reference Temp	How Much Used	Total Daily Exp. h:m
MATERIAL: Thyrox					WASP Ref: CH3794	
R50/53	Low				Low	1:0

Using the above data the assessment indicates that exposure needs to be controlled by means of a suitable form of General Ventilation. Reference to the following HSE COSHH Essentials control guidance sheets may help in deciding how to achieve the required control.

Control Guidance Sheets Nos. G100

Before implementing control measures in accordance with this assessment consideration should be given to eliminating or reducing the potential exposure through any of the following steps: use of less dangerous materials: use of solid materials which are less dusty: use of liquid materials which have a higher boiling point: use of a lower process temperature: use of shorter process times: use of smaller quantities of materials. The materials used in this process are listed above in descending order of their contribution to the exposure potential. Therefore consideration of measures to reduce the exposure potential should be addressed initially to the first material listed. A revised assessment may be conducted to see if any possible changes would have a useful effect.

In determining the appropriate control measures account also needs to be taken of any physical (e.g. flammability) and environmental hazards associated with any of the materials. Information on these hazards is highlighted on the appropriate WASPS sheets and may be found in the respective safety data sheets

Information concerning matters to be considered in implementing the findings of the assessment, including consultation with employees, training, maintenance, review, exposure monitoring and health surveillance can be reviewed by clicking here

Because the written word cannot entirely be eliminated, and as ESL already produces Safety Data Sheets in several European languages, it was a natural progression to provide WASPS in these languages, as well. Additional languages can be provided, if required.

WASPS software is proving to be an invaluable tool in universities and further education as well as manufacturing and service industries, such as Kellogg's and Rentokil-Initial. It has the potential to be of real benefit particularly in areas where non-scientists are using chemicals and products to produce an effect, e.g. engineering, art and media, crafts, construction.

Environmental Science Ltd
3 Station Approach, Station Road, March, Cambs PE15 8SJ
Tel: 01354 653222

Email: sales@esldatasheets.com
Website: www.esldatasheets.com

Technical Education - An Historical Perspective

Dr Dick Evans

I am introducing a rather valuable historical insight into technical education "through the ages", which we are unable to reproduce in full because of its length! I have been advised by the publisher Simon Shaw, T Mag of 11 King's Parade, Cambridge, CB2 1SJ that the content is freely available on www.tmag.co.uk

I encourage you to take a peek.
Editor

Introduction
I have undertaken to write a short history of technical education, with a particular emphasis on work-based education. Bearing in mind the current debates about the importance and position of vocational education within the overall education system I feel such an historical perspective could be useful for the following reasons:

1. To date very little attention has been paid to the historical context of our current quandaries over technical education
2. It will provide a host of insights into this country's current struggle to confront and tackle skills shortages and our ability to respond to and compete with the emerging global economies
3. It will provide pointers to the lessons and strategies for technical education aimed at industrial growth which has been spelt out over the last 200+ years but which successive governments and educationalists have continued to neglect or discard.
4. It will illustrate the extent of industrial decline in Britain over the past 150 years.

Although I have written extensively about many of the issues that will inevitably be identified in this series I hope that the analysis will be both interesting and illuminating by providing additional information about this very important and yet neglected aspect of the educational system.

This first part will set the scene and provide a backdrop for the later articles, which will cover the various historical stages beginning before the Industrial Revolution up until the present period.
One challenge when writing a history of technical education, say when compared with the history of other sectors of education, is the difficulty of getting hold of the existing literature which is both relatively sparse and little referenced - which again reflects the Cinderella image of the subject. Because of limitations of time and space I cannot hope to do full justice to this complex and fascinating topic as the major focus will be on England. Wales, Scotland and Northern Ireland each merit their own histories reflecting as it would their own unique, fascinating and interesting past.

England has never fully recognised the achievements and contributions that the other home countries have made to technical education preferring to look beyond our shores to other countries particularly America. This has been particularly true over the last couple of decades with the imitation of a number of work based models e.g. Training Enterprise Councils (TECs) which ultimately failed and again showed that the American system had little to offer. Interesting to note that Scotland and latterly Wales have developed some very innovative programmes in vocational education and modularity which in many ways is more impressive than those in England.

Gradual decline
One irrefutable truth that history highlights is this country's gradual industrial decline since the heady days of the early to mid nineteenth century. One important factor contributing to this decline was the long time it took to realise and develop a national strategy for technical education and training and the resultant failure to establish a network of technical education institutions. This last point is particularly evident when one makes comparisons with other European countries since the beginning of the nineteenth century.

For example France and Germany had already established technical universities in the early1800's whilst little happened in England until the turn of the 20th century and then only to a limited extent. Cambridge, Oxford and the public schools continued to neglect science and technology providing instead a classical education.
It was only after around 1860/70 that industrial cities like Birmingham, Manchester and London introduced scientific and technical training supported by merchants, manufacturers and industrialists. France and Germany rapidly established technical educations institutions including universities in order to develop people with higher level technical skills and knowledge thus creating a population of technocrats who would lead on their countries' industrial developments and production.

However it must be stressed that Scotland within the British context was an outstanding exception – but more of that later.

International Heliophysical Year

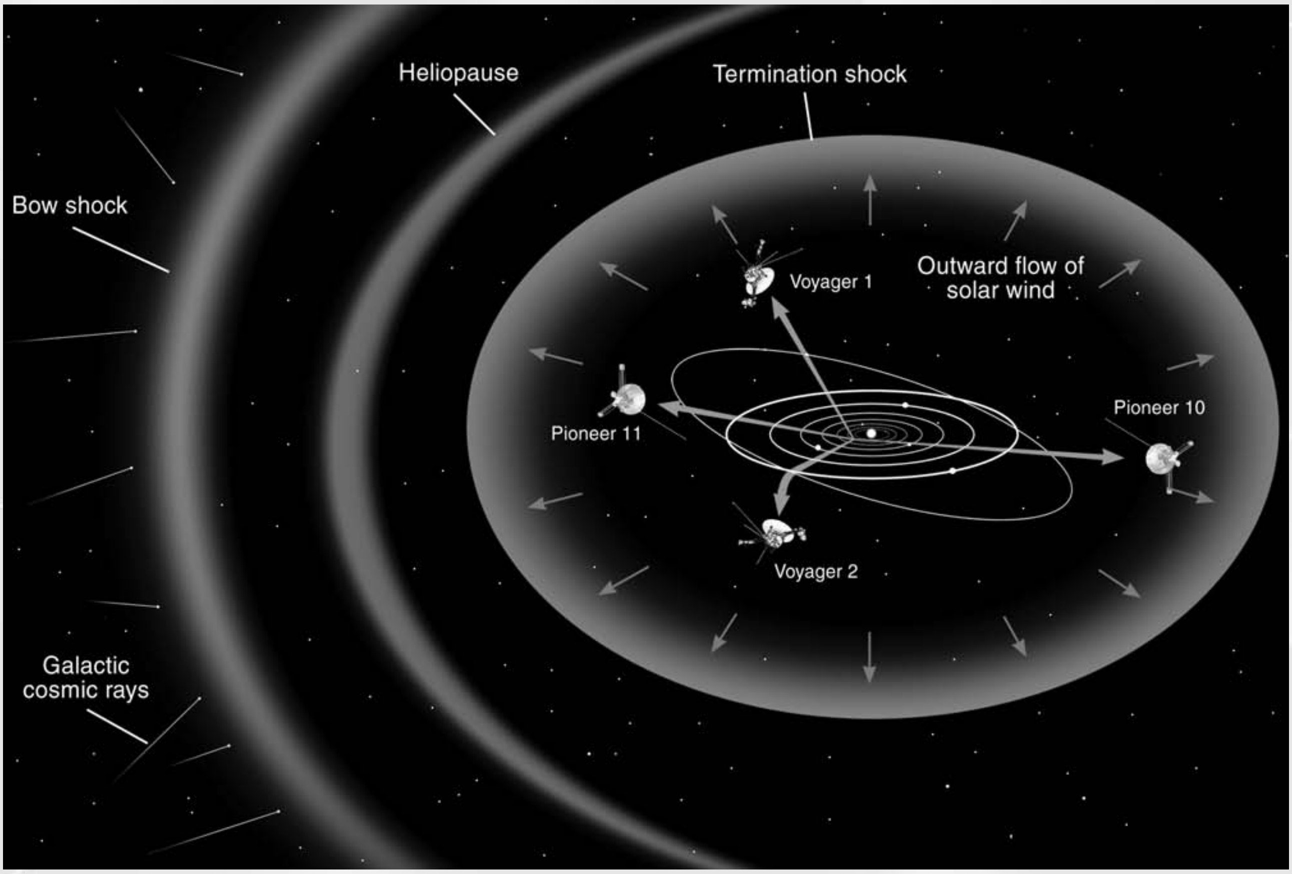
Dr Lucie Green

This year, scientists and engineers from all 191 Member States of the United Nations are participating in an international campaign to learn more about the Earth, the Sun and the Solar System. 2007 has been designated the International Heliophysical Year, or IHY. IHY aims to demonstrate the beauty and relevance of space science to the world, as well as providing co-ordination for research projects which study the environment within the Sun's magnetic bubble, called the heliosphere.

IHY has been timed to coincide with the 50th anniversary of the International Geophysical Year when Sputnik, the world's first artificial satellite was launched. IGY heralded the modern space era and the international collaborations that were formed at this time laid the foundations for the way space science is carried out today. 60,000 scientists came together around the world and this collaborative effort led to the discovery of the Van Allen belts and the mid-ocean submarine ridges.

50 years later, the scientific aims of IHY are broad and far reaching. They are to:

- understand how the planets respond to emissions from the Sun,
- study the fundamental processes which occur throughout the heliosphere,
- study how the Sun and the heliosphere interact with the interstellar medium which surrounds it.



An image of the magnetic bubble created by the outflow of the solar wind.

To achieve the aims, five science themes have been established. The first addresses the evolution and generation of magnetic structures which are known to fill the Sun's atmosphere, and the transient events that result from changes in these magnetic fields. The second focuses on energy transfer and coupling processes, the third on flows and circulation. The fourth science theme investigates boundaries and interfaces in the solar system, and the last involves conducting routine studies of the solar-planetary-heliospheric system.

The UK was one of the founder members of the IHY initiative and is currently involved in the science projects and their co-ordination. A special online facility has been developed by the UK which allows scientists worldwide to make links between the proposed research projects. This method is a great way to link up international research programmes.

UK scientists are mainly involved in studying emissions from the Sun, and are investigating how these emissions effect the Earth's environment during IHY. This includes the ionosphere, the layer of the Earth's atmosphere where the gases are ripped apart by the Sun's Ultraviolet and X-ray radiation producing a sea of charged particles, and the magnetosphere, the magnetic bubble that lies on the outer edge of the ionosphere. The main question being addressed is how these layers vary over time due to the Sun; a new area of science now known as Space Weather.

The Sun is constantly expelling material into the Solar System through a continual expansion of its hot atmosphere, known as the solar wind. This blows with speeds of between 400-800 km/s and carries charged gases and magnetic fields from the Sun's atmosphere toward the Earth. It is the flow of the solar wind that creates the heliosphere. Under certain conditions the magnetic field lines of the solar wind join together with the Earth's magnetic field lines (the magnetosphere), in a process called magnetic reconnection. When this happens the Earth's magnetosphere becomes open and solar wind particles penetrate into the magnetosphere. Injection of the solar wind particles produces many effects including wave activity along the Earth's opened field lines and produces heating in the ionosphere; this in turn leads to a movement of charged particles up from the ionosphere into the magnetosphere. A new project led by UCL's Mullard Space Science Laboratory will monitor this ionospheric outflow using the EISCAT ground based radar in Norway to observe the heated region in the ionosphere and the four European Space Agency Cluster spacecraft to observe the waves and ion heating along the magnetic field lines in the magnetosphere. The aim of the project is to understand how energy is transferred from the solar wind into the ionosphere.

In addition to the solar wind, there are sporadic eruptions of material that take place when a solar flare or a coronal mass ejection occur. Both of these events are produced by changes in the magnetic fields that thread the Sun's hot atmosphere. A build-up of energy in the giant magnetic structures leads to the ejection of bubbles of magnetic field and hot gases known as coronal mass ejections, or to sudden the acceleration of particles into the Solar System that takes place during a solar flare. The fastest coronal mass ejection recorded so far occurred on 4th August 1972 and travelled from the sun to earth in 14.6 hours - a speed of nearly 10 million kilometers per hour! The accelerated solar flare particles, however, can reach us in 20 minutes!

Space weather research has developed over recent years and scientists are interested in better understanding how emissions from the Sun affect the not only the space environment close to the Earth, but also its technological systems. For example, around £1 billion in satellite technology was damaged or destroyed as a result of the Sun's emissions during the time period 1997 to 2007. On 13th March 1989 emissions from the Sun interacting with the Earth's magnetic field caused a blackout in Quebec, Canada. It resulted in a £4 billion loss to the Canadian economy. Two very good examples of why the Sun is continually monitored. Currently there are around 12 space missions which allow the study of the Sun-Earth system.

A key player in understanding space weather has been the SOHO spacecraft. SOHO celebrated its 10th anniversary in space in 2005 and continues to operate extremely well, which is amazing considering the initial funding for the spacecraft gave it a lifetime of two years. SOHO is a project of international collaboration between the European Space Agency and NASA, and allows the study of the Sun from it's interior out to the orbit of the Earth and beyond. Using this spacecraft scientists have been able to make advances in understanding the science behind solar activity as well as monitoring and measuring the material that the Sun throws our way.

Two more recently launched missions are the Hinode and STEREO spacecraft that were launched in the latter part of 2006. The Hinode mission is a Japanese mission which has major contributions in terms of hardware and science from the UK and the USA. Hinode is equipped with three different telescopes that allow scientists to see the Sun's surface and atmosphere by detecting different wavelengths of light. Early results are already showing a plethora of activity in the Sun's very dynamic atmosphere. They have also shown regions in the Sun's atmosphere where material has been ejected to produce coronal mass ejections. The out-flowing material produces a shift in the wavelength of light it emits so that it appears more 'blue' as the material is coming toward us. The UK-led instrument onboard Hinode, the Extreme Ultraviolet Imaging Spectrometer, is able to observe these wavelength shifts by splitting the Sun's light into its component colours and analysing the resultant spectrum. Determining the source of the eruptions is crucial as it leads to the identification of which magnetic structures in the Sun's atmosphere are erupting.

STEREO is a unique mission which uses two spacecraft to give a view of the Sun's erupting structures in 3D in the same way are our two eyes give us a sense of depth and perspective. STEREO also allows scientists to view which erupting structures will be Earth directed. The two spacecraft are in orbit around the Sun; one is in an orbit slightly closer to the Sun than the Earth's and so moves ahead of us, the other is slightly further out and so increasingly lags behind. This orbital configuration leads to a 22 degree separation of each spacecraft from the Earth each year and means that they eventually get a good view of the space between the Sun and the Earth.

The UK led a team which supplied telescopes on each satellite called Heliospheric Imagers. Each consists of two small telescope systems mounted on the side of the STEREO spacecraft. They watch the space from the Sun out toward the Earth and beyond, sheltered from the glare of the Sun by a series of baffles. Blocking the glaring light of the Sun means that the faint structures of the coronal mass ejections can be observed. The HI's have provided the first opportunities to observe coronal mass ejections along the Sun-Earth line and will give the first 3D views of CMEs so that their structure, evolution and propagation can be studied.

The UK also has a strong involvement in ground-based facilities which monitor the Sun's effects on us.
One area of research studies the response of the Earth's magnetosphere to solar emissions using an instrument called a magnetometer. These instruments were developed almost 200 years ago to measure the direction and strength of the Earth's magnetic field. Modern magnetometers form the basis of sophisticated observatories which are sensitive to tiny changes in the Earth's field due to disturbances either in the ionosphere or the magnetosphere. By studying these disturbances we can learn about the Earth's near-space environment, just as measurements of tremors in the ground tell us about activity beneath the surface.

To allow the study of the 'bigger picture' of the Earth's magnetic field, hundreds of magnetometers are placed around the globe and operated by many different nations. The UK plays a key role in these instruments and measurements. The sub-auroral magnetometer network (SAMNET) records data from thirteen magnetometer stations in the UK, Iceland, Scandinavia and Russia. Deployed by the University of York and now operated by Lancaster University in collaboration with the British Geological Survey and the Finnish Meteorological Survey, SAMNET has been helping scientists investigate the electrical currents flowing in the ionosphere high above our heads and explore dynamic in the distant magnetosphere.

IHY promises to be an exciting year full of scientific discovery. For further information and the latest updates see www.sunearthplan.net

Institute Regalia

There is a new style tie available (as shown in the photograph).

These are navy blue and of a high quality. They are smart and modern.
A limited supply is available, so do not be disappointed, send off your order today.

There are still some of the older style navy blue and maroon ties available until stocks run out which are UK made in non-crushable polyester.

The prices are: -

Old style Blue Ties £4.50 + postage as below

Old style Maroon Ties £4.00 + postage as below

New Style Blue Ties £10.00 + postage as below

- **UK Postage 38p. per item**
- **Overseas Postage add £1.00**

All orders should be sent to:

Mrs C S Blyth FIScT,
Tigh A' Chnuic,
3 Law Road,
Dundee DD3 6PZ

Cheques should be made payable to: Institute of Science Technology Ltd.

Overseas orders should include a British Money Order.

IST gets HEaTED

John Robinson, Chairman

I am delighted to report that at the EGM in Manchester on 16th October our members voted unanimously to change the name of our Institute to the Institute of Science and Technology. This marks a move to a wider and more inclusive membership base and underlines our commitment to raising our profile and the status of our profession. As a result, we have been chosen as the professional body to take forward the issues identified by the HEaTED survey in 2006.

The HEaTED project is funded by the Higher Education Funding Council for England and is managed by a steering group chaired by Professor John Perkins, Vice-President & Dean of the Faculty of Engineering & Physical Sciences at the University of Manchester.

Professor Perkins was until recently Principal of the Faculty of Engineering and Courtaulds Professor of Chemical Engineering at Imperial College London.

His academic career spans periods at Cambridge University and at the University of Sydney as well as Imperial College. He has industrial experience with Shell and with ICI, in the UK and in Australia, and has acted as a consultant for a number of companies around the world. His research interests cover a number of facets of process systems, including process design, process control and process modelling and dynamic simulation. He is the author of around 200 papers, and he has supervised more than 30 successful PhD candidates.

Professor Perkins is a Fellow of the Royal Academy of Engineering, the City and Guilds of London Institute, the Institution of Chemical Engineers and the Institute of Mathematics and its Applications. He is a Chartered Engineer, Chartered Mathematician and Chartered Scientist.

Other members of the HEaTED steering group are as follows:

Project Manager - Matt Levi, Training and Development Adviser and IST member

Project Consultant - Bob Hardwick, IST President and LFHE Consultant

Secretary - Wendy Mason, IST Office and Leadership Foundation for HE.

Steering Group Members:

Tracy Allan, Senior Policy Officer, HEFCE

Paul Dixon, Head of Staff Training and Development, University of Manchester

Keith Barber, IST Member & HEATED – Manchester

John Robinson, IST Chairman

Debbie Greenwood, Principal Staff Development Officer, University of Leeds

Carol Davison, Technical Services Manager, University of Leeds

Tracy Bell-Reeves, Staff Development Unit, Canterbury Christ Church

Alan Armstrong, Facilities Manager, University of Strathclyde

Andrew Taylor, Staff Development and Training Unit, University College London

Mike Robinson, UNITE the Union (Amicus)

What HEATED has to produce

HEaTED is funded by HEFCE via the University of Manchester which is in effect the budget holder. The HEaTED deliverables are very much in line with IST core values - which is no surprise at all considering that we have been well represented from the outset! The main things we need to achieve are

- Revamping the HEaTED web pages; transferring it to the IST site; and widely promoting/marketing it to the technical/specialist staff community
- Reviewing the 'Skill Development Programme/Database and re-launching on a UK wide basis in Spring 2008
- Re-branding of the current tech-man mail base to HEATED@jiscmail.ac.uk with immediate effect
- Revision of the Continuing Professional Development (CPD) Award/Framework in conjunction with HERA – work is due to be completed early in 2008
- Updating and revising of the HEaTED survey material in time for a second survey in Summer/Autumn 2008
- A major national conference is being planned for technical/specialist staff and staff developers - further details will be circulated as and when developments occur but in the meantime could you please put the following in your diaries: Tuesday 10 June 2008, Whitworth Hall, Manchester University

What is our relationship with HEaTED?

In effect, it will be a partnership, working close together to produce the outcomes above and hopefully more in the future. The relationship is not a merger. HEaTED is purely a project with goals and deliverables, but it needs an organisation which is representative of HE technical, specialist and managerial staff with which to work if it is to be effective. IST remains as it always was: independent, democratic and run by members, for members. But we now formally embrace staff outside the science domain as well. We know that there are staff in the arts, humanities, IT and pure technology who share our core values and for whom our mission and bylaws are entirely suitable.

What you can do to help

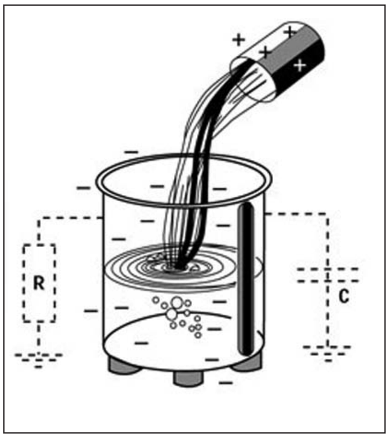
We can all take part by simply contributing to the communication of the project. Tell your colleagues and friends about this new and important step forward, even if they are not involved. Raising our profile is not just about amongst ourselves but also in the workplace in general; teachers, scientists, artists, industrialists, administrators and even friends and relatives. Make sure they all know that we are members of a respected profession and that HEFCE have recognised the valuable role that we play to the extent that they have provided funding via one of the leading UK Universities to help deliver our shared goals.

Are you a Walking Hazard in the Workplace?

Newson Gale Limited

Beware of your own voltage generation.

It is a common experience to receive an electric shock when approaching a door handle, metal filing cabinet or closing the door on one's car. If this spark occurs whilst handling flammable liquids or working with explosive powders – fires, explosions, resulting deaths, personal injury and destruction of plant. Simple understanding of static charge generation will ensure you are not the ignition source.



Many lab and pilot plant processes involve pumping, stirring, blending, crystallisation or dissolving, all of which can create static. For a highly conductive liquid this charge can flow to the vessel and away along the earthing cable to ground. If a liquid or solid has a low conductivity and then this static charge can build until it can be discharged in the form of a spark.

The simplest and most common way of ensuring that any electrostatic charge does not accumulate is to ensure plant is grounded before processing begins. However ensuring a good earth is being kept by persons working with the flammable chemicals is often unappreciated and overlooked.

If a person is isolated from earth, either by wearing shoes with insulating soles or by being on a floor surface with little or no conductivity, then static electricity can accumulate on their body or clothing as they move around. It is surprising to learn that a person can become charged to a level as high as 30,000 volts, and this energy can be discharged in a spark when they come in close contact with an earthed object, or one at a lower electrical potential. Storing this voltage does not cause the person harm, in the same way that coming into contact with a high voltage power line would, because there is no continuous current flowing through the body.

The energy given up in the spark is likely to be of several milli-joules (mJ) and in fact, needs to be at least a few milli-joules in order for the shock to be felt. It is interesting to note, therefore, that most solvent vapours can be ignited with a spark containing less than one milli-joule of energy! Even some dust clouds can be ignited by a static discharge from a person. Hence, it is vital that static charge build-up is prevented on people entering Potentially Explosive

Atmospheres. This is most usually achieved by ensuring that, firstly, the floor has a suitable level of conductivity and secondly, that the person is wearing static-dissipative / anti-static footwear.

Internationally recognised standards and reports on static control in flammable areas give upper and lower limits of conductivity for footwear and flooring. The lower limits are there to help with the prevention of electric shock from mains voltage and ensure that there is not TOO much conductivity. The upper limits are set to ensure that there is sufficient conductivity to allow static electricity to dissipate. The European EN ISO 20345 Standard and U.S.A. Code NFPA77 both quote an upper resistance of 1x10^9 ohms

(1000Mohm) and the British Standard 5958 and European Cenelec Report R044-001 give an upper resistance of 1x10^8 ohms (100Mohm). It is possible to obtain footwear testing devices to ensure that the shoes conform to the limits shown, but it is important to remember that the tester must have a test range which matches the footwear resistance level chosen by the user.

The above mentioned standards are widely used in the Chemical, Paints & Coatings and Pharmaceutical industries. However many of the footwear testing devices available on the market are designed to work in conjunction with footwear used in the electronics industry. This is made to EN61340- 5: Protection of Electronic Devices from Electro-Static Phenomena, and has an upper limit of 3.5x10^7 ohms (35Mohm). It can be seen that the Electronics industry level and those selected in the other industries mentioned are different. It is therefore very important to understand which type of footwear is being used and to select the appropriate test device, in order to ensure that the footwear and the tester are compatible. It should be noted that, at present, by far the most common type of footwear used by these industries in Europe and the U.S.A. has an upper limit of 1x10^9 ohms (EN ISO 20345 or NFPA77).

The standards also mention types of outer garment materials (such as cotton or anti-static coatings) which are best at preventing charge build up. Whilst these garments may be necessary in explosive atmospheres with very low MIEs (Minimum Ignition Energy), in general, it is recognised that the main action to avoid is the removal of garments in the flammable area, as this can lead to a rapid generation and build up of static.

It can be seen that the prevention of the build up of static charge on people is equally important as any other static prevention measures. A clear policy on footwear type to be used and regular testing, to ensure that the footwear of both staff and visitors is correctly specified, is always recommended.

Physiological effects and igniting powers of sparks

Energy discharge (mJ)	Physiological effect	Ignition possibility
0.5	Undetectable	Ignites many vapour / air mixtures
1	Barely detectable	Ignites vapour / air mixtures
5	Detectable	Ignites some dust clouds
10	Prickling sensation	Ignites dust clouds
100	Slight contraction	Ignites many dust clouds
1000	Sharp contraction	Ignites powders

To address the need for the understanding of electrostatic charge generation and to provide the products and services of this specialised area of safety Newson Gale Ltd has developed the 'Cenelectrex' range of comprehensive range of earthing hardware, multilingual training materials and the 'Sole-mate' footwear tester.

Please visit our website at: **newson-gale.co.uk**

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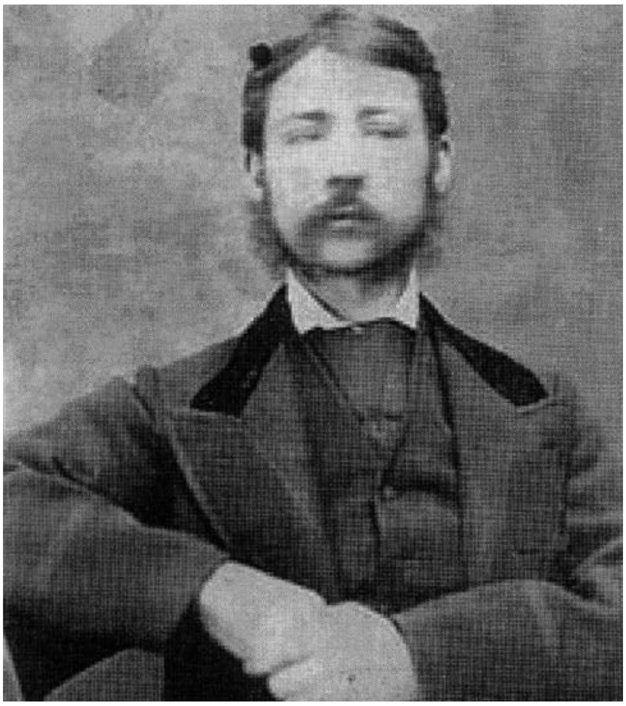
James Jobling and Pyrex

Alan Gall, IST Archivist

Scientists in general, and chemists in particular, have long been familiar with borosilicate glass under the brand name of Pyrex. Featuring low thermal expansion with good mechanical strength, it has applications in a wide variety of laboratory apparatus. The Corning company in America developed the material itself but in this country production flowed from the Sunderland glassworks of James A. Jobling. Although various histories of Pyrex have appeared in print little has ever been written about James Augustus Jobling himself (JJ for short). Perhaps this is partly justified because he had little to do with obtaining the Pyrex manufacturing rights for the UK. The credit for securing this extremely lucrative contract actually belongs to Ernest Joseph Purser, son of JJ's sister, Julia Alice Purser. When Corning approached various British manufacturers it was only Ernest Purser who appreciated what a 'golden egg' was on offer. However, it was JJ who persuaded his nephew to help operate a run-down glassworks – the rest, as they say, is history.

Family stories paint James Jobling as a man with a vile temper - quarrelsome, domineering and generally cantankerous.
One thing known for certain is that he was capable of physical violence, and it is precisely because of this unpleasant character trait that a photograph and description of JJ as a young man have survived - thanks to the contents of his criminal record!

JJ appears to have been the black sheep of the family.
His father, Mark Lambert Jobling, was a successful solicitor, the District Registrar of Her Majesty's Court of Probate, who served as Sheriff of Newcastle-upon-Tyne in 1850. The Joblings were related to the Lamberts, owners of coalmines. Mark was in partnership with several others, including one of the Lamberts, running the Hartley mine in Northumberland. The Hartley Colliery is infamous in the history of the mining industry. Prone to flooding, it closed in 1844 only to be reopened as the New Hartley Colliery under Jobling, Carr & Co. *The Illustrated London News* of 25th January 1862 reported in great detail on 'One of the worst colliery accidents in this country resulting in the immediate deaths of five poor fellows and the suffocation of 215 others.' Instead of providing the mine with separate means for entry and exit, the owners had specified a single shaft with a central wooden partition (not an uncommon practice in those days). When a massive beam, part of the pumping system used to remove water, snapped in the middle, the shaft became blocked with the falling debris.



James Augustus Jobling aged 26

James Jobling did not set out to be a glassmaker. Whilst his brothers Alfred and Mark Ernest chose to study law like their father, James became an oil and mineral merchant. He ran the Tyne Oil and Grease Works from offices on Mosley Street in Newcastle-upon-Tyne (moving to 72 Grey Street) and later described himself as a grease manufacturer. The grease works stood near to Scotswood Road in South Benwell, a district of Newcastle adjacent to the River Tyne. His business also encompassed the supply of raw materials used in glass making.

Meanwhile, James Angus, a glass and china merchant running a warehouse on Grainger Street in Newcastle-upon-Tyne, had formed a partnership with commercial traveller Henry Greener. The pair began the manufacture of domestic glassware in Sunderland around 1858 and this continued until the death of Angus on 20th June 1869. The business then operated under Henry Greener's name alone. In 1871 the operation moved to a new factory called the Wear Flint Glass Works, perhaps a little confusing for deliverymen since the Wear Glass Works belonging to James Hartley & Co already existed in the vicinity. Hartley's works closed in 1896 so the word 'Flint' was later dropped from the factory's name without causing any problems. After the death of Henry Greener in 1882, the business ran into financial difficulties and was unable to pay its principal creditor - none other than James Augustus Jobling. Thus, James found himself owner of a glassworks in about 1886.

James knew next-to-nothing about glassmaking so did little to develop his new enterprise, which continued to run under the name Greener & Co. After about fifteen years he had an idea that would transform the fortunes of the business. Somehow, he managed to persuade his nephew to leave both his home in Ireland and a job with the engineering firm of Parsons. Ernest joined his fearsome uncle in 1902.

The Wear Flint Glass Works was built between the North East Railway line and the back of houses on Alfred Street, in an area of Sunderland called Millfield. A map published in 1897 shows that the site covered just less than two acres. This would double by 1955 and further expand with the later demolition of Alfred Street, but in the early years of the century the prosperous times were still ahead, waiting for the big opportunity to come.

Map of 1895 showing James A. Jobling's glassworks

The small town of Corning in New York State was home to the Corning Glassworks, which had been founded at Massachusetts in 1851. In 1908 they established a research laboratory that was successful in developing a heat resistant glass to be known as Pyrex. By 1915, Pyrex appeared on the American domestic market and within a few years had begun its ascent towards status as a global product. Typically, the UK was cautious about the merits of the new glass. Corning contacted various manufacturers in this country only to be generally rebuffed. Ernest Purser, however, appreciated the financial possibilities and signed a deal with Corning in 1921. So, the relatively modest Wear Glass Works began to manufacture a commodity that would soon see demand outstrip production capacity to an embarrassing degree.

The characteristics of Pyrex make it eminently suitable for producing both household cooking utensils and laboratory glassware. Thus sales were able to progress on two fronts, ultimately resulting in the splitting of the product lines to go their own separate ways. Household Pyrex went on sale at Harrods store in 1923 with the boast: 'English made Pyrex – even better in quality than imported.' The gift set of dishes, which contained eleven items of ovenware, was on offer at thirty shillings. This would be comparable to someone today spending around £270.

Ernest Purser clearly had good business sense and oversaw many improvements to the works. On the personal side, one of his great interests was aviation. He competed in several of the King's Cup air races held before the Second World War. These were sometimes hazardous affairs; as in 1933 when he crashed a de Havilland Rapide near Newcastle and in 1937 when his Whitney Straight aircraft ran out of fuel. Neither of these incidents caused him any injury or dampened his enthusiasm for flying. During the Second World War he donated £5000 from his own pocket and a further £5000 from the company to a fund created to buy fighter aircraft for the war effort on behalf of the town of Sunderland.

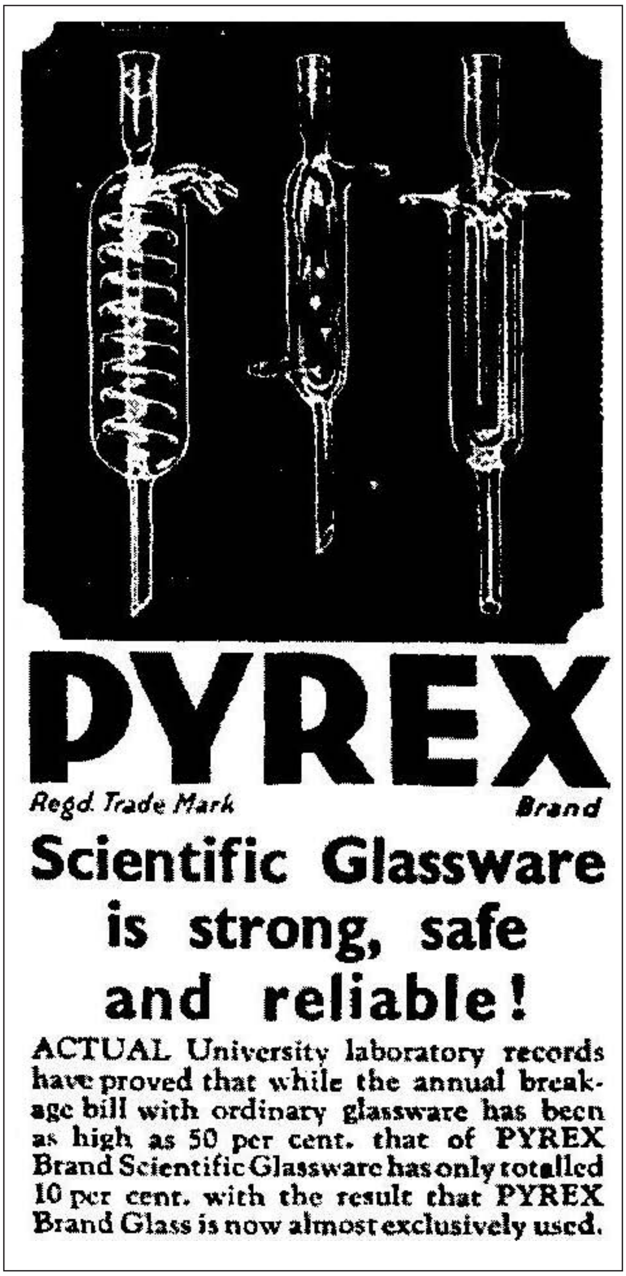
At the beginning of 1927 (at the insistence of uncle James) Ernest changed his name to Jobling-Purser, perhaps precipitated by his looming marriage to Dora Broadbent. The marriage was to be tragically cut short – Dora died 15 months later at Nice after a botched operation for appendicitis. Ernest was then fifty-three years of age but waited another ten years before re-marrying, to Dorothy Griffin. The couple had four children together, Caroline, Timothy, Juliet and John.

As early as 1935, Pilkington Brothers of St.Helens had acquired a stake in Joblings. Some years later they had total control. In 1949, Ernest Jobling-Purser retired and was succeeded by his nephew Charles John Purser-Hope. The next year, Pilkingtons sold 60% of their shares in Joblings to a holding company called Thomas Tilling Ltd, then severed connections entirely by disposing of the remaining 40% to Corning Glass in 1954.

Chance Brothers of Smethwick and James A. Jobling were the main suppliers of borosilicate glass to Quickfit and Quartz Ltd of Stone. When Chance Brothers decided, on rather short notice, to cease production of borosilicate the directors of Triplex Safety Glass (the parent company of Q&Q) had to go cap-in-hand to Joblings. As a result, an amicable arrangement was made in 1953 to combine Q&Q's chemical-plant glass with Pyrex glass pipeline under a new company, QVF Ltd. Each partner held half the capital of the enterprise.

Under the control of Tilling, agreement was reached in 1958 for James A. Jobling & Co to acquire Quickfit & Quartz Ltd from Triplex. This was paid partly in cash and partly in Tilling ordinary shares. Tilling had built up an extensive portfolio of acquired businesses and was seen by the Triplex board as a good investment.

Indeed, events were moving at a considerable pace.1960 saw the formation of Electrosil Ltd as a joint venture between Joblings and the Corning Glass Works of Canada Ltd, and the start of a £2M expansion plan at the Sunderland Works.



Advertisement from 1935

James A. Jobling Ltd, originally incorporated on 21st February 1921, became a public company in August of 1961 and for the occasion published some details of the firm's assets. The main factory (Wear Glass Works) occupied 11 acres with a floor area of 576,000 square feet. Warehouses at various locations gave another 36 acres and land at Stone accounted for a further 90 acres. The total staff level for the group was given as 3450 employees. Laboratory glassware maker H.J.Elliott Ltd of Pontypridd was bought in 1964 with brand name E-Mil (adding it to the trade-mark Hysil, already acquired from Chance Brothers). Elliott's factory closed in 1972.

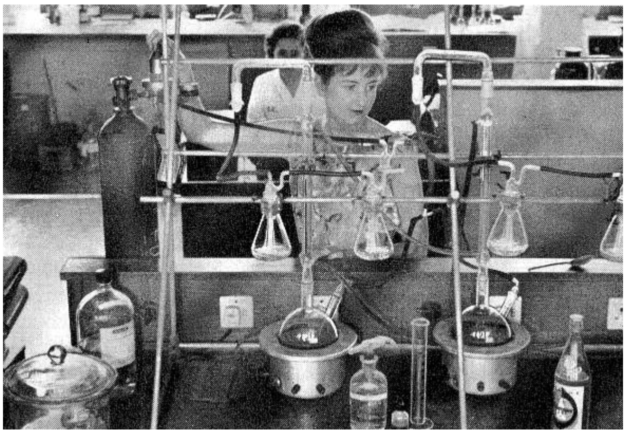
Joblings became wholly American owned in 1973 after Tilling's 60% share passed to the Corning International Corporation. There then began a series of take-overs, group formations, group restructurings and closures. The year 1975 saw several events: a change of name from James A. Jobling & Co Ltd to Corning Ltd, the acquisition of Evans Electroselenium Ltd, a 38% stake in L'Equipment Industrial En Verres Speciaux of France, and the purchase of the remaining shares in Electrosil Ltd. In 1976 Electrosil, also to be renamed - as Corning (Holdings) Ltd - became part of the Corning Electronics Division. Studies during 1975-1976 had indicated that that the hot glass production at Sunderland needed modernising, as did the UK distribution network. Corning Teoranta of Ireland, a subsidiary of Corning (Holdings) Ltd was disposed of in 1978 and warehouses at Colnbrook and Bardsley followed.

The 1980s brought some fresh ventures. QVF Ltd, by then a dormant company, gained a new lease of life under the name Corning Biosystems Ltd, specialising in technology for industrial biology, and on 6th April 1981 Malkin Ltd of Stoke-on-Trent started trading as a manufacturer of specialist ceramic equipment. At about the same time, Corning International Corporation transferred the trading operation of Gilford Instruments Ltd to Corning Ltd's Medical Division. The year finished with an agreement between Corning Ltd and the Milk Marketing Board to jointly develop a process for manufacturing foodstuff from hydrolysed whey. Corning Ltd also added Hazleton Laboratories Europe Ltd to its group structure, in 1988. The most important development of this period, however, was an equal partnership with BICC plc in 1985 to work on optical fibres. Many of these enterprises were short-lived. The interest in Specialist Dairy Ingredients, the hydrolysed whey project, went in 1985, Malkin Ltd was sold in a 'management buy-out' in 1987 and Hazleton UK Ltd (previously Hazelton Laboratories Europe Ltd) passed back to the original owners, Corning International Corporation.

J. Bibby Science Products (later Bibby Sterilin Ltd and now Barloworld Scientific Ltd) bought the laboratory glassware division in 1982. Cookware division went to the American based Newall Company, makers of blinds, hair products and pens, in 1994, who resold to the French firm ARC in 2005. Corning Ltd continued on a smaller scale with technical glassware products, adjacent to ARC's plant on the Millfield site. James A. Jobling & Co Ltd had reported a staff level of 3450 employees in 1961. In 1997 Corning Ltd disclosed that the employment figures stood at 147 on glassware and 470 working on optical fibres. The Optical Fibres section, based at Deeside, continued until Corning International Corp announced on 4th October 2001 that it intended to close the factory.

Although they were separate companies, the two producers of Pyrex at Millfield enjoyed an economy of scale by sharing facilities. Corning put an end to this by deciding to close the technical glassware plant. Corning Ltd finally ceased production in March 2007 and ARC in September 2007, so ending the large-scale manufacture of glassware in Sunderland.

E-Mil was the trade mark of H.J.Elliott Ltd



Pyrex laboratory glassware in action

The Newcastle Daily Journal of 2nd January 1873 reported in some depth on a court case that involved members of two well-known local families. The plaintiff in the action was Thomas Charles Grainger and the accused James Augustus Jobling. The facts presented to the court were as follows.

James Jobling had his eye on a lady. We do not know this woman's identity but Granger levelled some insult, or supposed insult, against her. The police record indicates that JJ was of small stature and this may have curbed any impulse to defend the lady's honour at the time. Instead, he arranged for a message to be sent so that Grainger would be lured into a quiet place suitable for a sneak attack. Approaching from behind, in a dark spot, JJ then delivered a hefty blow with a horsewhip. The incident occurred on 16th November 1873.

JJ appeared before magistrates, where he attempted to defend his actions by some 'mud-slinging' against Thomas Grainger. He was given bail and an indictment charging him on two counts: one of wounding and a second of grievous bodily harm. By the time that the case came to court, the lawyers on both sides had cooked up a strategy for reducing the seriousness of the offence. With the approval of Grainger, JJ withdrew his previous insulting comments made to the magistrates and the lawyers then asked that the lesser charge of common assault be added (to which JJ would plead guilty). Granger even went so far as to say that he felt none the worse for the assault. The judge was having none of it. Apart from the fact that common assault was not part of the original indictment, JJ could hardly claim to have defended the lady's good name in the heat of the moment – he had planned his vengeance over the course of three days. Not that the judge didn't have a little sympathy. According to the newspaper: '… he [the judge] could quite understand that when a gentleman was placed at the bar…the punishment inflicted upon him had a far more acute effect…than the same punishment would probably have upon a man in the lower ranks of life.' Despite his social standing, JJ had certainly not displayed the manners expected of a gentleman and so received a month in prison for 'unlawful and malicious wounding', but at least without the added burden of hard labour.

The criminal record reveals that JJ stood 5 feet 4_ inches tall, with light brown hair, blue eyes and a sallow complexion. Also, his cheek carried a large scar. Did Charles Grainger's display of forgiveness come from a financial inducement? Maybe. The scar on JJ's face does suggest at least one previous altercation so perhaps he was wayward enough to need buying out of the odd spot of trouble. Certainly this episode would have been a blot on the respectable image of his family (his solicitor father had died in 1870 and so did not live to see the disgrace). What JJ thought about being incarcerated, even for a short time, can only be surmised from the final words of the report in the Newcastle Daily Journal: 'Mr Jobling wished to say something, but on the suggestion of his council he refrained, and was at once removed.' James Jobling's retirement in 1928 probably came as a great relief for those working under him. To keep him away from the business he was encourage to move up to an estate in Argyllshire that family legend says was won over a game of cards. Sometimes he would go missing for several days, to be found, if anyone wanted to, in one of many brothels. JJ never married and died on 6th January 1932.

ACKNOWLEDGEMENTS AND SOURCES

I am indebted to Tim Jobling-Purser, son of Ernest, for family information.

Thanks are due to Sarah Mulligan and staff at Newcastle-upon-Tyne Local History Library for turning up the 1873 newspaper report and other material. The photograph of James A.Jobling from the criminal records is reproduced by kind permission of Tyne & Wear Archive Service (document reference PR.NC/6/1 No 1080). Company records came from Companies House.

Apart from the articles named in the text, various reports in The Times were consulted and also the following books:

The Glass Industries of Tyne & Wear Part 1, (Tyne & Wear County Council Museums, 1979).

How it all Began, Maurice Baren (Smith Settle, 1992)
Pyrex: 60 Years of Design, (Tyne & Wear County Council Museums, 1983)

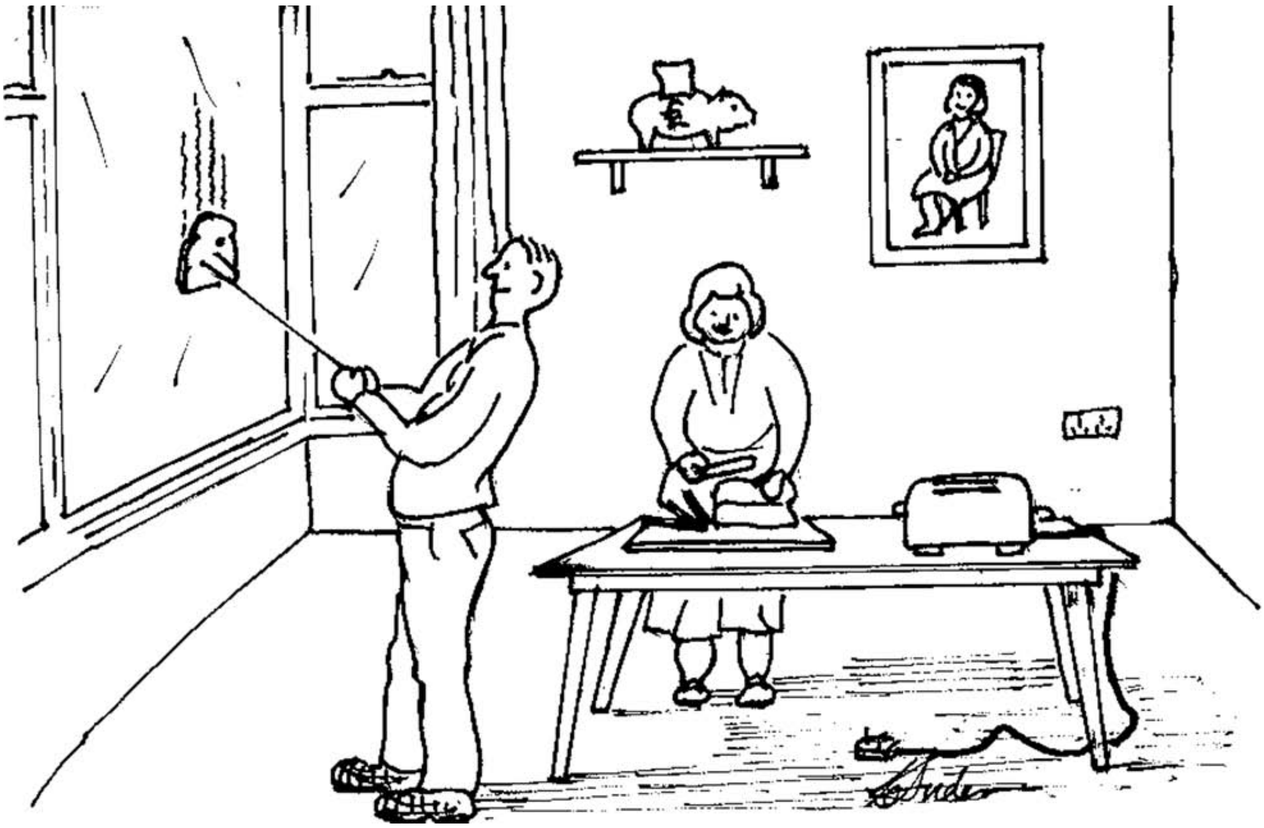
I am also very grateful for the help given by Nigel Alder and Paul Brougham at Corning Ltd.

Financial support for research costs was provided by SDA Electronics Ltd, Salford.

Versions of this article have appeared in the Journal of the British Society of Scientific Glassblowers and in Touch Paper, the newsletter of the Open University Chemistry Society.

Window Films: Transparency & Beating Glass at its own game.

Phil Murray



Over the years architectural glass has seen technological advances from crown glass manufacture through to the Pilkington's float line. More 'modern' advances include toughened and laminated glasses. Many of the technological advances have focussed on production - faster, bigger, & better. However, there are technologies that can enhance the most desirable quality of glass – transparency.

There is no doubt that glass is so successful because it is see-through. It lets light in and out, it is chemically durable, weatherable, and in recent times, relatively cheap. So, how can we do better? In my opinion, glass is a fabulous substance, but as with anything, there is always a little room for improvement. At the very least, there is room for more suitability to specific applications.

Glass treatments and coatings are nothing new but there are new developments all the time. The Window films industry is one sector where developments are progressing rapidly.

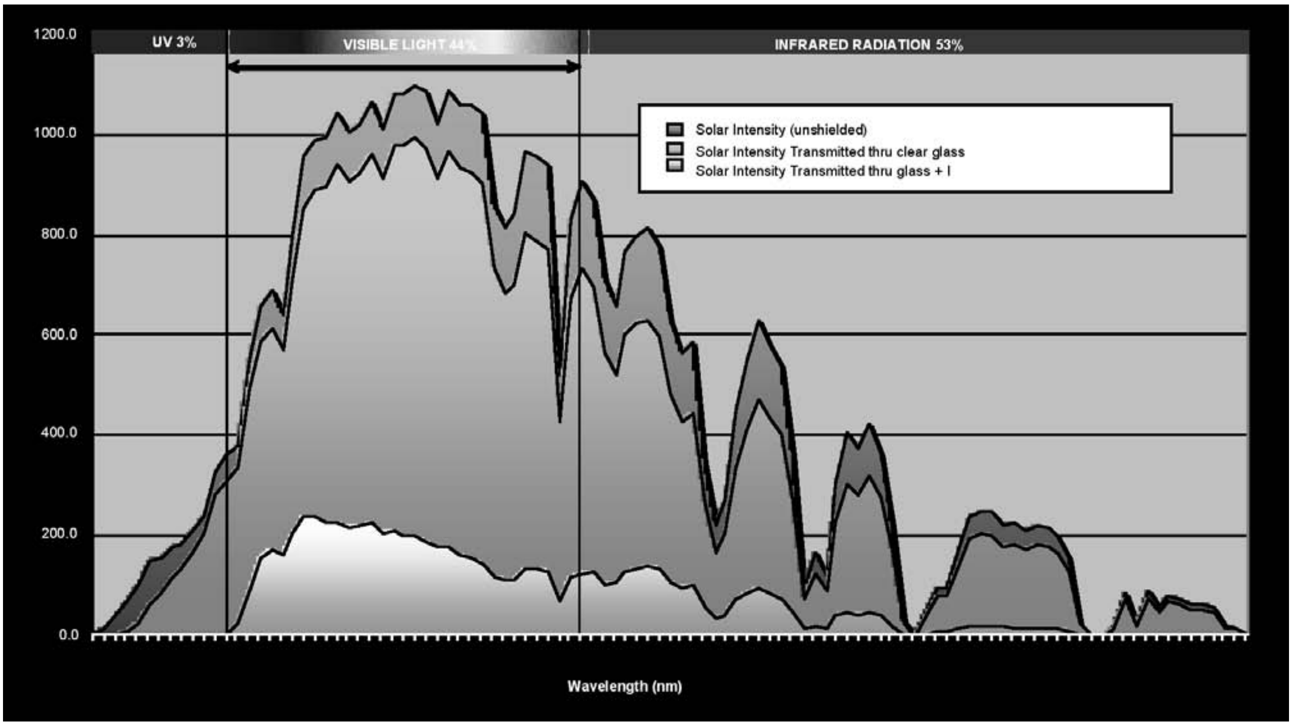
Many people might ask – ***"What is a window film?"***

The concept dates back to the 1960s. The idea was to control the heating and cooling imbalances that result in a building from direct sunlight (solar loading). Films were made to be retrofitted to existing windows (stuck-on) that would reflect solar radiation back from a window, preventing the warming of inside surfaces normally hit by direct sunlight while still allowing vision through the glass.

To which many would reply, ***"Ahh, I see. So, what is a window film?"***

Well, in its most simple form, such a film is composed of a layer of polyester to which a scratch resistant (SR) coating is applied on one side; a mounting adhesive layer and a protective silicone release liner is laminated to the other side. When the release liner is removed, the side with the adhesive is applied to the interior surface of the glass. Prior to lamination, the films can be dyed & treated to change the transmission, absorbance and reflectance properties of the glass.

By coating a transparent substrate (film or glass) it is possible to select which parts of the electromagnetic spectrum the film will transmit. In most cases, the parts of the spectrum of interest to window films are those in the UV, Visible, and Infrared ranges.



Soda Ash in float-glass blocks UV radiation in the 200 to 300nm range (UV-B & C). However, UV-A (300-380nm) is transmitted (the one that causes wrinkles). With a window film, UV absorbing chemicals are combined with the adhesive and the polyester during manufacture, a necessary step required due to the detrimental effects of UV on polyester. This results in a standard 99% rejection of UV radiation. With a speciality film, 99.99% UV rejection can be achieved.

The scratch resistant coat is an acrylic polymer. These are also sensitive to ultraviolet light, so they are always applied facing into the building on the inside of the glass, so that the UV absorption in the glass, adhesive and film will protect the acrylic SR coating.

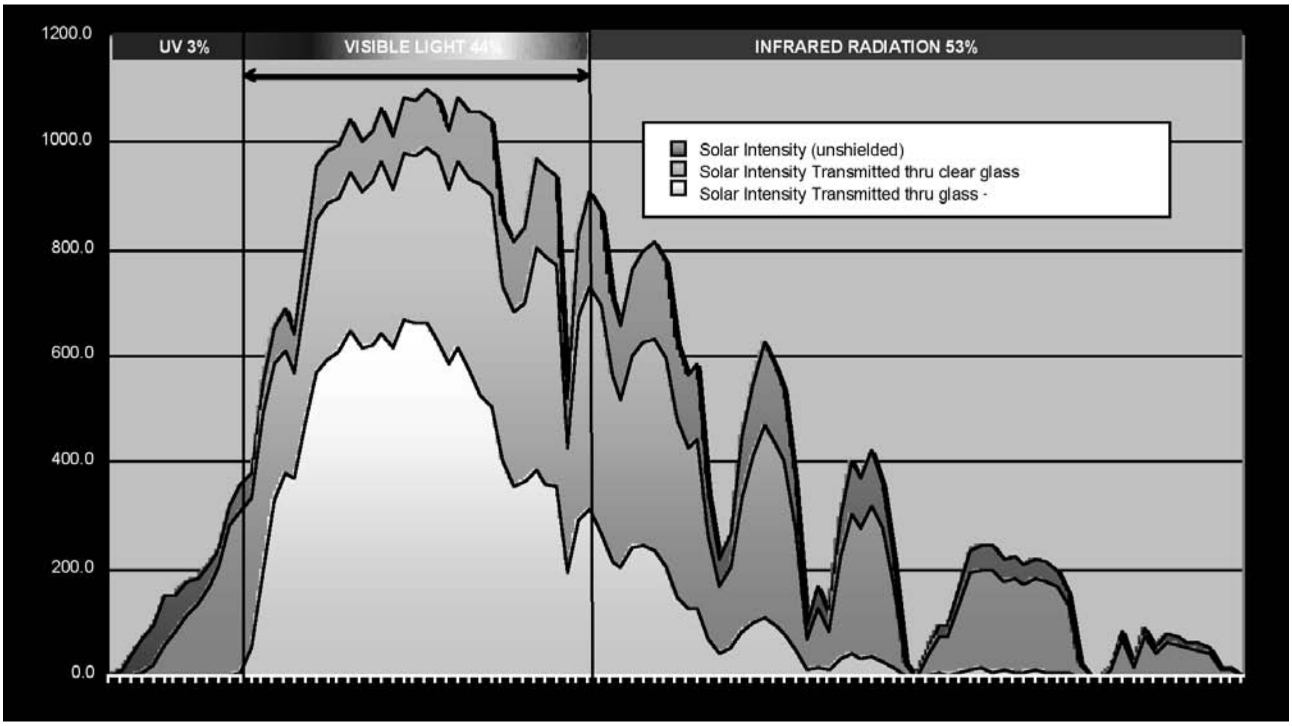
The processes associated with deposition of precious metals are familiar with many based in the scientific field. Polyester films can be metallically coated either by the vapour deposition of aluminium, or by sputtering with metals & alloys, even Ceramics & oxides. In the case of films for architectural glazing, instead of metallising the glass (which would be impossible as a retro-fit) the metallised films can be applied with the same effects of increased absorbance, reflectance or both.

But why does any of this matter? To some, the answer is connected to that wonderful Victorian invention and very British extension to the domicile – the conservatory.

Ok, why would anybody want to change the transmission properties of their conservatory? Take this example. The Spectra below shows three curves: solar intensity under daylight conditions (in watts per square metre), solar intensity through clear glass, and the smallest curve, solar intensity through a metallised film. It can be seen there is a significant reduction in intensity across the range, but the UV and Infrared wavelengths are dramatically reduced. If we take the area under these curves the total reduction in w/m2 can be calculated, known as the TSER. That means more typing and some sums, so let's not do that (but trust me it's 79%). Instead, let's try and consider how much energy can be rejected. A rough average of 1000w/m^2 of solar energy is transmitted to earth's surface at noon on a cloudless day. Naturally, the geographical & topographical location will affect how much solar energy a building gets, in addition to building aspect ratio, azimuth, glazed area, and a host of other factors.

Imagine if we could block just half of that energy (however much it is), and for example, on a conservatory window with 5 m^2 of glass. In full sun that's 2.5Kw of energy that your air conditioning doesn't have to work against. Modern Architecture employs a greater use of glass than used previously, and these large glazed areas have the potential to transmit significantly large amounts of energy, especially on an office building with 3000 m^2 of glass. Together with high occupancy/small footprint buildings, rising energy costs and the trend to install air-conditioning in anywhere warmer than good pint of ale, these factors have all helped raise the profile of these films & coatings as a method of energy conservation. Further to this, when the installation cost is offset against the reduction in energy costs (incurred by running HVAC systems etc) high-quality films frequently pay for themselves within 2 – 3 years. Hence, they are a preferred product of energy service companies.

In addition to energy savings, the films are applied for aesthetic reasons and to reduce glare. They are manufactured with various defined percentages of light intensity. Some films with a high luminous efficacy (high ratio of visible transmitted light to solar energy rejected) can transmit 58% of the visible spectrum, and reject 58% of the total solar energy – an effect achieved by sputter coating a film with multiple oxide layers that absorb wavelengths of solar radiation invisible to the human eye.
And that's were we come back to transparency – and how to improve on it. Take the spectra below for example:



Compare the smallest curve to that in the first spectra. These are both metallised films. However, this film transmits far more visible light than the first (200% more) albeit with a slightly lower energy rejection. (TSER 58%)

Glass is undoubtedly one of our best inventions. Architecturally, it simply allowed man to let the sunlight in, while keeping the wind and rain out. Fantastic, we'll take two. Now, (business) man demands sleek looking buildings with lots of glass that lets specific parts of sunlight in, while allowing people to see out but not in. Oh, and if possible to attenuate "other parts" of the electromagnetic spectrum, for various reasons. Some people are never satisfied.

Well, such demands have been placed, and now the demands have been met. The idea of attenuating RF energy is being widely accepted as the digital age unfolds. In this period that seems to be defined by "security threats", several have been identified with respect to electromagnetic signals. Electromagnetic interference (EMI), Electromagnetic pulse (EMP), the security of wireless connectivity and electronic eavesdropping are all-important considerations for those who handle sensitive information.

Even domestically, most who have a wireless Internet connection in their home will employ a basic form of defence- namely password encryption. Although buildings can and do attenuate these signals, they will easily pass through glass. As an example, listed below are some common wavelengths used for communications purposes.

FM Radio & TV – 88 MHz to 800 MHz
CB Radio – 26.9 to 27.4 MHz
Remote Garage Doors – 40 MHz
Cordless Phones – 40 to 50 MHz
Baby Monitors – 49MHz
Air Traffic Control – 960MHz to 1.2 GHz
Flight radio – 133 MHz to 393 MHz
Mobile/Cell phones 824MHz – 1.9GHz
Wireless LAN (802.1x) – 2.4 GHz & 5.6GHz
Bluetooth – 2.45 GHz

Window film can selectively block these electromagnetic signals much in the same way as infrared can be blocked. Film components are laminated together that absorb different bands of electromagnetic radiation, and by combining components, even commercially available signal defence film can provide >33dB of signal attenuation in a 30MHz – 6GHz range.
RF frequencies tend to be absorbed by the film components and dissipated as heat. Such films can do all this, and still have a visible light transmission of 70%.

Again, the transmission properties of glass can be "tuned" to suit specific applications. Every 6dB of attenuation cuts the signal strength in half, protecting against passive eavesdropping, interference, laser microphones, and eavesdropping methods that employ visible light wavelengths. At least now, an electronically secure building can appear to be a normal office block (indeed individual rooms can be protected in shared blocks) rather than a windowless bunker.

Phil Murray is a member of the British Society of Scientific Glassblowers and a version of this article originally appeared in the April 2007 issue of their journal. Phil is an award-winning glassblower who, at the time this article was written, worked as Technical Services Manger for CP Films, covering the Middle East, India and Africa.

*Acknowledgment and thanks to artist **Ken Anderson** for the picture*

"You broke it, you mend it"

Paul Le Pinnet, SOG Ltd

Surprise to say that this was my introduction to Scientific Glassblowing. At the age of 21 and "stuck" in an analytical laboratory, my work was routine but it did include surface area determination of a fluid catalyst which was done on a glass vacuum line some 8 feet in length, with all the paraphernalia required to create a vacuum, such as backing pumps, diffusion pumps, manifolds and gauges, all controlled with high vacuum taps which had a habit of falling out; breakages occurred and pilot error was always blamed!

The site glassblower came regularly until his patience gave out. He set about showing us lesser mortals how to mend cracks, replace taps and check for leaks. It was soon apparent that trying to join two pieces of glass together was more of a challenge than the chemistry involved. Forty-one years on and the challenge is still there.

Scientific glassblowing has developed over the years from the alchemist's retort to the fused silica equipment used in silicon chip production. For general laboratory work a borosilicate glass is used which is relatively inert, although it doesn't like hot phosphoric acid, alkalis or hydrofluoric acid – then again who does? The big advantage (if you can find a glassblower) is the ease of construction of glass apparatus and the fact that you can see what's going on. If you can see a change it can be a confirmation of a theory, a start or a finish.

Theoretical chemistry with computer modelling has an ever increasing value in science but there is still a place for "hands on" physics, chemistry or engineering as a stepping stone towards pilot plant before further development to full scale. The need for scientific glassblowing has developed alongside chemistry and physics: the original glass retorts might be alright when "changing base metal into gold" but when Liebig jacketed an air condenser and was able to control temperature it became apparent that to jacket a flask and cool or warm up a reaction gave more control over the chemistry.

During the 1920's PYREX borosilicate glass was developed which in turn gave rise to interchangeable jointed glassware, vacuum in glass reactions and improvements in distillation techniques, and more and more complex glassware. One thinks of strip silvered, vacuum jacketed, multi-plate Oldenshaw columns, topped off with swinging bucket fractionating head and triple-coil condensers. Some of this equipment is beautiful in its own right, so much so that there is a flourishing antique market for glass scientific instruments. At the beginning of World War II a good percentage of glassblowers in Britain were German and they were given the option to continue working on behalf of this country or of spending the duration on the Isle of Man. Thankfully some worked on and taught others, especially Neon tube workers who's products were less than useful in a blackout. The first RADAR tubes were made by hand! During the war great strides in technology were made, as minds were concentrated towards one aim. Glassblowing machinery had to keep up with the demands of closer tolerances. Glass equipment had to be interchangeable and to a standard - the "British standard".

In 1966 I became be part of Harold Wilson's "white heat of technology". I decided on a career change and delved into the black arts of scientific glassblowing. I was very fortunate to be trained by David Greenhalgh at Manchester University. "Practice makes average" so practice it was, co-ordinating left and right hands to control the molten glass and overcome gravity's tendency to help the glass sag, drip and tumble into your lap! To understand how the glass reacted to touch and temperature required practice, practice and more practice. Every step of the way was a new experience: getting the glass to do what I wanted it to do could be frustrating, although the workshop was equipped with two lathes which unlike metal-working lathes had two chucks timed to rotate together at variable speed. A flame is used to pre-heat, melt and anneal the glass; carbon tools are used to shape the molten glass.
I looked upon the lathes with envy as I was forbidden use them until I could perform the glassblowing tasks on the bench, by hand, the logic being " what would happen if there was a power failure, Eh?"

From T pieces to flasks, Schlenk tubes, vacuum lines and diffusion pumps, it seemed as if I was improving and when in 1971 I was asked to join together a gas chromatograph and a mass spectrometer, I realised that something was afoot by the reaction of those present. Seven years on and the question became: was I as good as I thought I was? Time to put it to the test and a change of employer to ICI Organics at Blackley, Manchester. The type and complexity of large jacketed vessels was a challenge on a daily basis. I had three other colleagues and drew on their accumulated skills. Making multi-walled vessels from the inside out requires a skill appreciated by glassblowers since once started there is no turning back. Whenever anyone was doing a complex job, the rest of the team would watch from a respectful distance: if successful, appreciation was shown by a courteous silence, if failure, hoots of derision greeted the poor unfortunate.

It was during this period, at the age of 30, I realised that my ability to control the molten glass had become automatic. It's a bit like driving a car: first it's all new and complicated then in time one's feet start to work on their own and you can concentrate on other things like the rest of the traffic! From this time on I was able and prepared to meet any challenge with enthusiasm, yet another 30 years on and it still holds a fascination trying to transform a research scientist's idea into a workable piece of kit.

The first signs of the demise of ICI became apparent to the workforce in the 1970's and by 1980 I was moved to Mond Division at Northwich, in Cheshire, a heavy chemical plant based mainly on common salt, soda ash and sodium bicarbonate. Although they were "old products", development was still taking place and the glassblowing had to be tailored to the product as alkali solutions dissolve glass – therefore thicker walled glassware was the order of the day. Analytical methods were the same as those used by Brunner and Mond from the days when the company was first established in 1873. Orsat burettes were made by hand and calibrated on what can only be described as a bombsight from a Zeppelin. Each mark was scribed through a beeswax resist then etched with 60% hydrofluoric acid for 6 minutes to give a perfect line which when cleaned was filled with enamel. Bear in mind that 500 lines per burette was not uncommon.

1990 and I was moved to ICI General Chemicals Division at Runcorn, Cheshire where I worked closely with the fine mechanics to produce double spiral platinum wound probes to close tolerances in both borosilicate and silica. Soon the split between ICI and Zeneca resulted in research with a small r and some development of existing products. A management buyout of the ICI facilities led to change but fortunately there was a decision to retain the technical skill base, unlike many large chemical companies who themselves have "down sized " their research facilities.

I currently provide a glassblowing service to 100 external companies and with the reduction of many other glassblowing facilities my workload has increased, but so has the variety. The best part of scientific glassblowing is "enabling the customer" – being part of their project, advising on the design and limitations of glass either working from engineering drawings or simple sketches. Quite often lots of arm waving is involved and "it's got to ...." The glassware does not have to be the most complicated to have an impact, just look at a simple Pasteur pipette and the effect it has had on medical science.

In 1980 the British Society of Scientific Glassblowers in conjunction with the joint Universities Council approached the government of the day to raise concern over the lack of trained glassblowers. The Minister of Science and Technology responded negatively and did not feel it was a cause for concern. Fortunately, during my recent attendance at the European Glassblowing Symposium in Veldhoven, the Netherlands. I was delighted to see that there were so many young people in full time training and that the glassblowing schools in both Holland and Germany are flourishing.

There are six trainee scientific glassblowers in Britain at the moment. Should there be resurgence in research while a goodly proportion of existing glassblowers are nearing retirement age we will we have to make a quick phone call to Germany once again, although there is always eBay!

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IST New Members/Upgrades April 2007 – October 2007

NEW MEMBERS LIST

Membership No	Members Name	Grade
T14572	DAFITOHWO, O.J.	MIScT
T14573	PAGE, T.D.	MIScT
T14574	JACKSON, M.E.	FIScT
T14575	AFMED, U.D.	Assoc IScT
T14577	WEBSTER, J.R.M	MIScT
T14578	ODULAJA, A.O.	MIScT
T14579	CARTER, G.	MIScT
T14580	LING, D.	MIScT
T14581	OYEJIDE, N.E.	Assoc IScT
T14582	OKAH, A.M.	MIScT
T14583	BAXENDALE, J.	Assoc IScT
T14584	NDAGIRE, S.	MIScT
T14585	OLAYIWOLA, S.A.	Assoc IScT
T14586	FASASI, A.A.	MIScT
T14587	HOPE, J.	MIScT
T14588	TWINOMUGISHA, E.T.	Assoc IScT
T14589	McKANE, S.D.A.	Assoc IScT
T14590	NIXON, S.K.	MIScT
T14591	SYKES, A.	MIScT
T14592	NARKEY, L.	Assoc IScT
T14593	DOWUONA-HAMMOND, N.R.	Assoc IScT
T14594	LEVI, M.	MIScT
T14596	ADEOYE, B.O.	MIScT
T14597	RUFAI, O.K.	MIScT
T14598	KEERS, K.	MIScT
T14599	AROBIEKE, A.K.S.	MIScT
T14600	TURNER, R.	MIScT
T14601	ASHWORTH, M.	MIScT
T14602	ELLIS, P.	MIScT
T14603	BAKER, J.M.	MIScT
T14604	WEBB, C.L.	MIScT
T14605	SUNG, R	MIScT
T14606	DAVIES, A.	MIScT
T14607	BOOTE, V.A.	MIScT
T14608	MURYN, C.A.	MIScT
T14609	BLUNT, G.	MIScT
T14610	PORTEOUS. G.	MIScT
T14611	MEADOWS, R.G.	MIScT
T14612	HEWITT, L.M.	MIScT
T14613	JOLANTA, T-H	MIScT
T14614	LI, L.W	MIScT
T14615	THURGOOD, D.O.	MIScT
41 IN TOTAL		

REINSTATEMENTS

Membership No	Members Name	Grade
T11829	CHIDZIK, R.G.	MIScT
T12259	COUSINS, J.E.	MIScT
T13115	OKOLO, V.E.	Assoc IScT
T13300	KPELLY, P	MIScT
T13349	TELAHOUN, G	MIScT
T14114	AKANBI, K.T	MIScT
T14438	SHADWELL, C.E	MIScT
7 IN TOTAL		

CPD AWARDS

Membership No	Members Name	Grade
T14616	WEBB, J.S.	MIScT
T14602	ELLIS, P.	MIScT
2 IN TOTAL		

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Notes

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