The Institute of Science & Technology

The Journal

Winter 2008




The Official Journal of The Institute of Science & Technology –
The Professional Body for Specialist, Technical and Managerial Staff
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Reverse of cover page.

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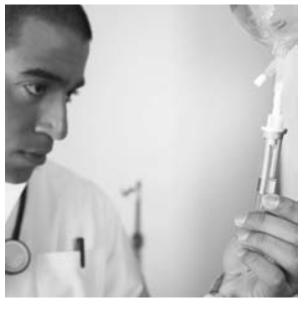


Editorial

Now that a very efficient and capable Editorial Board exists, which includes the redoubtable new editor - Ian Moulson, I thought it time to proffer my resignation from the role of Honorary Editor by handing to a younger man! I had experienced various roles within the Council of the IST and when a new challenge was available I decided to dip my toe into the murky waters of the press.

I have had 22 memorable years of association with the role, which has seen it transferred from an Aberdeen publisher (who sent out sheets of proofs to read) down to London for me to get my "cut-and-paste" single handed operation set up organised, and to reduce the journal costs! My first issue, unfortunately, was memorable for the wrong reasons as my daughter was ill in hospital and I sat at her bedside till 4am in the morning reading and correcting it! You needed a good eye, when pasting, to make sure it looked realistic but there were few complaints. Interestingly, members did spent more time actually writing letters then so it helped guide the content.

We switched to an A5 size in 1987 and then had our first glossy cover in 1995. The IST ran a very successful International Photographic Competition for 17 years and this helped fill some pages with startling and staggering images. With the advent of personal computers the role became easier and the editing fine, as long as my computer would read the various strangely formatted discs I received containing articles. As now, there existed a core of dedicated authors happy to write on a variety of subjects, which encouraged you other members to dip your pen into the ink. Our 50th anniversary year saw a 96-page booklet, called Annual Science Review, with 8 papers and advertising!! The journal further developed into an A4 issue until its present exciting format which has allowed us to use the cover for some of the colour illustrations to the inside text and has been greeted with wide acclaim. The IST occupied space in the ILM (Insitute of Leadership and Management) headquarters at Lichfield for a number of years and one of the design team - Dawn Osborn - was offered as support for the journal. Her design skills far outshone mine and so she deftly proceeded to use sophisticated software to significantly upgrade the visual standard of the journal.

I am forever grateful to a good number of IST members for not only making some of their precious time available to write articles, but also because they led me to other potential contributors. Sometimes it was difficult to balance each issue but I tried to arrange for "themed issues" which allowed me to approach Vice Presidents and others to set up a programme of articles often up to 2 years in advance. Nowadays the Editor sets up half the copy and selected authors contribute to the remainder but, as an honorary post, there is a restricted time available especially in the present economic climate where you are considered "suspect" if you do not have your nose to the grindstone.

I fully endorse your new Editor and hope you give him as much support as you are able, not only to make the journal interesting to read and refer to but to make your career more interesting through your own contributions. Remember, it is your Institute and its success depends on you as much as to the few, who have selflessly devoted part of their lives to make your occupations pleasant and meaningful.

Bon voyage

Ian Gray

Sad News

Fred Grover

It is with great sadness that we report the death of our Vice President Fred Grover an active member for many years. We will no doubt have our own personal memories of Fred 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

The IST's Education Board needs YOU!

Work arising from the IST's involvement with the HEaTED project and from other initiatives will require additional input from the Education Board.

This may include, amongst other things:

- Devising operating procedures and documentation and revising existing ones,
- Devising and reviewing practical training exercises,
- Assessing and moderating evidence submitted during work towards a qualification or award,

Therefore, the IST is seeking additional members to join the Education Board. If you feel that you have relevant skills and an interest in education and training please contact us at office@istonline.org.uk with your name and a contact point, indicating briefly what input you feel you could offer.

Mentoring

The IST Mentoring Scheme is underway. If you need advice on how to progress, shape or change your career in science and technology please contact the IST Office in the first instance. They will put you in touch with an appropriate senior IST member on our mentoring team who will have knowledge and experience in your particular area.

Article submissions for the JOURNAL

We welcome article submissions covering all areas of science and technology, particularly from people who may wish to publish for the first time. We also encourage article submissions which cover new technological advances, diverse technology and unusual aspects of technology.

Contact the editor: i.moulson@shef.ac.uk

Or the IST office: office@istonline.org.uk

The guidelines for article submissions to the IST Journal are as follows:

1. Article submission deadlines;
    - Summer edition is **30th April.**
    - Winter edition is **30th September.**
2. Articles should be submitted in Microsoft Word .doc format with images sent separately as JPEG files. This is our preferred option; please contact the Editor for other formats.
3. **Short articles:** these can be submitted in any length up to a maximum of 4x A4 pages including images with a font size no smaller than Pt12 (roughly 1500 words max).
4. **Major articles:** these should normally be no longer than 10x A4 pages including images with a font size no smaller than Pt12 (roughly 4000 words max). Please contact the Editor for longer submissions.
5. All accepted articles will be edited into the IST Journal's house-style.
6. All articles must be written in UK English. *(If English is not your first language, you should ask an English-speaking colleague to proofread your article.)* Articles that fail to meet basic standards of literacy may be declined by the editors.
7. Articles should be submitted as separate email file attachments. The email should clearly state "Journal Article Submission" and be sent electronically to office@istonline.org.uk

Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

AIM OF GHS: ONE CHEMICAL, ONE LABEL – WORLDWIDE

All over the world there are different laws on classification of hazardous properties of chemicals and how information about these hazards is then passed to users, e.g through labels and safety data sheets. This can be confusing because the same chemical can have different hazard descriptions in different countries.

In 1992, the United Nations Conference on Environment and Development (known as the Earth Summit) met in Rio de Janeiro. This was the largest environmental conference ever held, attracting over 30,000 people including more than 100 heads of state.

One particular agreement, concerning a commitment to sustainable development and agreed by many of the world's governments, provides a framework for tackling today’s social and environmental problems, including air pollution, deforestation, biodiversity loss, health, overpopulation, poverty, energy consumption, waste production and transport issues. It addresses the development of societies and economies by focusing on the conservation and preservation of our environments and natural resources. This agreement, known as ‘Agenda 21’,and the others that were made, covers every aspect of sustainable development deemed to be relevant. They, and their guidelines, are still adhered to today and are influencing many political and business decisions.

One component of ‘Agenda 21’ is the Environmentally Sound Management of Toxic Chemicals, Including Prevention of Illegal International Traffic in Toxic and Dangerous Products. It was acknowledged that a substantial use of chemicals is essential to meet the social and economic goals of the world community and today's best practice demonstrates that they can be used widely in a cost-effective manner and with a high degree of safety.

Six programme areas to address the issue were proposed and one of these was the development of a system for harmonization of classification and labelling of chemicals. It was agreed that a globally harmonised hazard classification and compatible labelling system, including material safety data sheets and easily understandable symbols, should be available, if feasible, by the year 2000. This was not a totally novel concept since harmonisation of classification and labelling was already largely in place for physical hazards and acute toxicity in the transport sector. International bodies, in co-operation with regional and national authorities that already had existing classification and labelling systems, were tasked to review the existing systems and elaborate a harmonized hazard classification and labelling system to be used for supply and transport. This has become known as the UN GHS.

The 2000 target date passed but the 2002 UN World Summit on Sustainable Development, in Johannesburg, agreed that the GHS should be implemented worldwide and set the target date of 2008. This commited countries to make the necessary laws to require suppliers of chemicals within their territories to adopt the UN GHS.

The UN GHS aims to ensure that information on the hazardous properties of chemicals is available throughout the world in order to enhance the protection of human health and the environment during the handling, transport and use of chemicals.

It provides the basis for harmonising regulations on chemicals at national, regional and worldwide level and the UN anticipates that, once fully implemented, the GHS will:

- enhance the protection of human health and the environment by providing a system for hazard communication that is comprehensible throughout the world.
- provide a recognised framework for those countries without an existing system.
- reduce the need for testing and evaluation of chemicals (agreeing/harmonising classification will help to reduce the need for animal testing).
- facilitate trade in chemicals whose hazards have been properly assessed and identified on an international basis.

The UN GHS is not a formal treaty but, instead, is a non-legally binding international agreement. Therefore countries (or trading blocks) must create local or national legislation to implement it.

Some countries and trading areas around the world, e.g. Japan, New Zealand, have already adopted the GHS and many others are working towards implementation. Within the European Union, Member States asked the European Commission to prepare a proposal for a Regulation which would implement the UN GHS criteria in the EU. At the time of writing (September 2008), the European Commission has accepted proposals for a **Regulation on Classification, Labelling and Packaging of substances and mixtures (CLP).** This Regulation will be direct-acting, requiring no national transposition, and is expected to come into effect by the end of this year (2008). Its provisions will be phased in over a period of seven and a half years and will require that single substances are classified in accordance with the GHS by 30th November 2010 and preparations/mixtures by 31st May 2015.

In Europe, legislation affecting classification and labelling of chemicals for supply was first introduced in 1967 (before the UK joined the Common Market) and has continually been refined and extended using the Dangerous Substances Directive (67/548/EEC) and the Dangerous Preparations Directive (1999/45/EC) and their amendments. In the UK, these Directives are implemented by means of the CHIP Regulations[1] which introduced the hazard classification and information systems with which we are familiar. For suppliers of chemicals, they contain detailed information, usually based on physiological, toxicological and ecotoxicological data to enable any physicochemical, health and environmental hazards to be determined for a single substance or a preparation. They also enable the appropriate Risk and Safety phrases to be selected.

The methodology behind the GHS is similar but the ranges are, in some instances, different leading to a change in classification under this system. There are also hazards which can be evaluated under CHIP but which are not yet incorporated into the GHS. The GHS is automatically reviewed and revised every two years.

Under CHIP	Under CLP / GHS
6 Pictograms, black symbol on orange square	9 Pictograms, black symbol on white diamond with red border
8 Signal words	2 Signal words
Risk phrases	Hazard statements
Safety phrases	Precautionary statements

What differences are we going to see?

- New symbols/pictograms on labels and safety data sheets

In addition to incorporation of existing symbols for explosive, oxidising, flammable, toxic, corrosive and dangerous for the environment, the GHS introduces three new pictograms described as 'Exclamation Mark', 'Gas Cylinder' and 'Health Hazard'.

The St Andrew's cross to designate Harmful or Irritant will no longer be used.

- Instead of the range of signal words that are currently used to describe a hazard, there will be only two – DANGER or WARNING. There will also be levels of classification that use neither pictogram nor signal word.
- Hazard Statements, as laid down in the GHS, will be used to describe the hazard/s of the material
- Precautionary Statements (also laid down in the GHS) will provide information and guidance on safe handling, storage and disposal
- Classification of a material may change in line with the GHS criteria defining hazardous properties

How can we prepare?

1. Spread the word

Ensure that everyone who uses hazardous materials, whether in a laboratory, workshop, pilot plant, factory, etc. is familiar with the symbols, hazards and safety information. This includes students, estates and maintenance staff and cleaners, amongst others.

2. Obtain information

Ensure that suppliers provide accurate and up-to-date safety data sheets for their products.

3. Address COSHH[2] and DSEAR[3]

Prepare to update COSHH and DSEAR assessments in the light of the GHS classifications and safety information provided.

4. Communicate information on hazards and controls within the workplace

Prepare to replace posters, signage, internal hazard sheets, etc. used to remind people of the nature of the materials in the work they are undertaking[4]

Wider effects

Within the European Union, the effects of the Classification, Labelling and Packaging Regulation on suppliers, manufacturers and service providers are going to be immense. Software packages will have to be rewritten, electronic systems will have to be amended, labels will have to be replaced and everybody involved will have to spend time and effort in getting to grips with the new requirements. On top of this, the Registration process, under the REACH Regulation[(5)], will gradually generate additional information about hazards, exposure scenarios and risk management measures for each substance, to be incorporated into safety data sheets in order to provide users with good-quality guidance on safety and control measures.

Footnotes

1 *Chemicals (Hazard Information and Packaging for Supply) Regulations*

2 *Control of Substances Hazardous to Health Regulations*

3 *Dangerous Substances and Explosive Atmospheres Regulation*

4 *'Communicating Chemical Hazards in the Workplace', IST Journal, Autumn 2007*

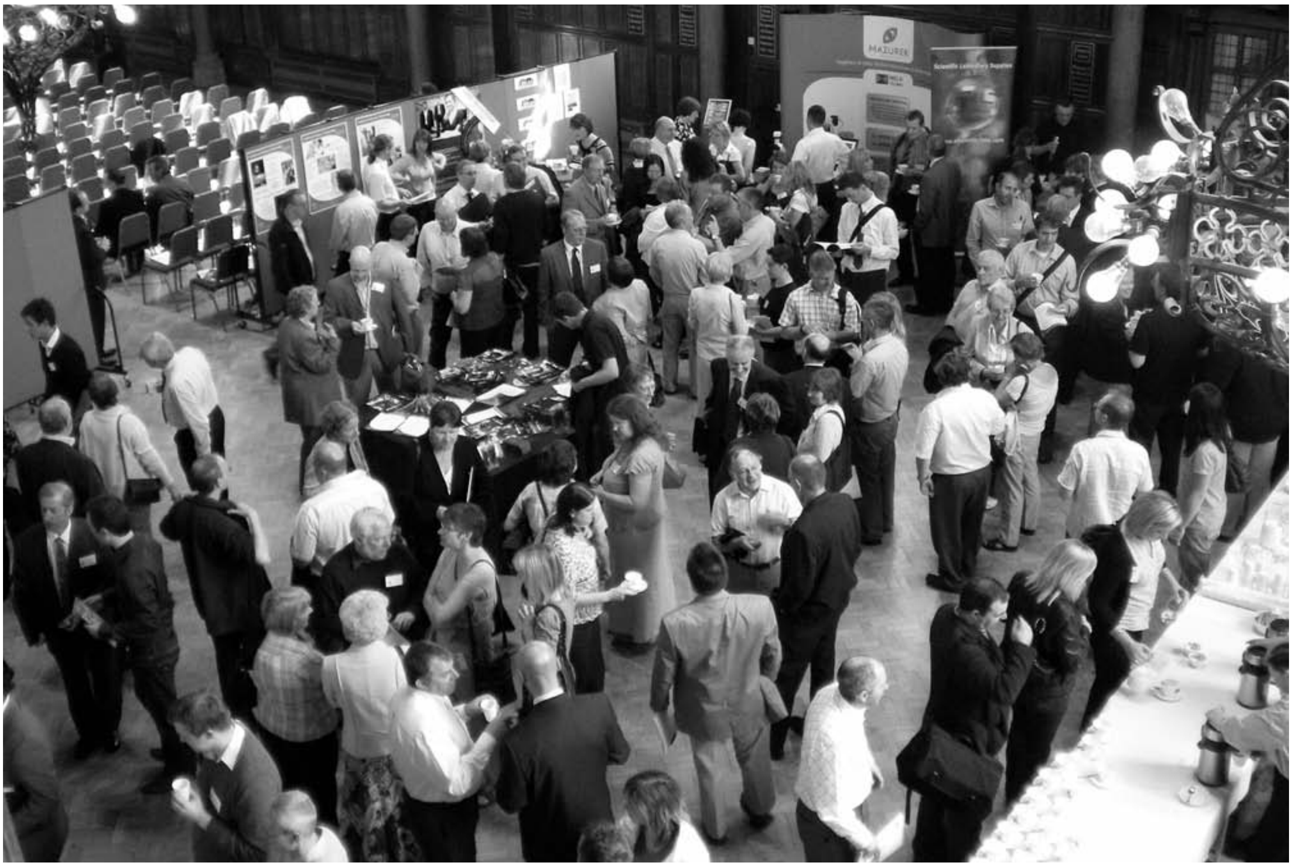
5 *'REACH: Registration, Evaluation and Authorisation of Chemicals', IST Journal, Spring 2008*

Environmental Science Ltd
3 Station Approach, Station Road, March, Cambs PE15 8SJ
Tel: 01354 653222
Email: sales@esldatasheets.com
Website: www.esldatasheets.com

HEaTED project

(Higher Education and Technicians Education and Development)

John Robinson



The first UK wide conference for Higher Education Technical Specialists under the **IST/HEaTED** banner was held at Whitworth Hall at the University of Manchester on June 10th. Nearly 300 people attended, coming from all over the UK, making this unique event a huge success.

Support for the **HEaTED** project (Higher Education and Technicians Education and Development) was resounding, sending out a clear message that Higher Education Technical Specialists and Managers want a professional body which will co-ordinate and lead as an umbrella organisation for their professional development needs. The conference delegates came from a range of disciplines, including the arts, sciences, IT and other backgrounds. The IST and HEaTED are encouraging specialist groups to come forward and work with them in a number of ways. Information on progress and learning resources identified will be made available to member HEIs when HEaTED soon becomes a subscription membership organisation through a state of the art web based virtual learning environment.

IST have produced an exciting new **CPD** programme (Version 2) that is immediately available to all Technical Specialists and Managers working both within and outside of the HE sector. The programme can be accessed and assessed on line. It is supported by a huge (on line) library of learning resources developed by goodpractice.net, experts in the field. The programme is based on development through generic CPD role profiles designed by ECC LTD who are well known for their work on the framework agreement and ERA. This means that individual learners can customise the programme to meet their exact individual professional development requirements.

The keynote address was given by Professor John Perkins, Vice President of the University of Manchester, Dean of the Faculty of Engineering and Physical Sciences and Chair of the HEaTED Steering Group. His speech, 'The vital role of technical/specialist staff in HE' was succinct, highlighting first the excellent reputation of UK universities worldwide (significantly in the Shanghai Jiao Tong University league tables), followed

by the contribution of UK universities to the economy, the vital contribution of technical staff to excellence in research and teaching and the need to recognise and build upon this to ensure continued success in the future.

The morning's presentations were themed around the CPD and VLE and described the ethos of the scheme and an outline of how it was designed, plus an overview of IST, the benefits of membership and an unashamed recruitment drive. There were Q&A sessions with the speakers, and the delegates were given 250 handsets so that their views could be polled instantly and electronically. The results are available to view on our web site.

The afternoon session was designed to get delegates to think about career development with an excellent presentation by Jackie Goodall from Leeds describing her career path: chequered and highly successful. There was also further detail on the CPD design and development and a full and frank talk from Ken Jakeman describing his experiences with V1 of the CPD in Birmingham.

The coming together of IST and HEaTED is an important step forward in the recognition of our professionalism. IST represents the workforce's views via it's membership and ensures quality and parity; HEaTED is a HEFCE project and it is our expectation (and HEFCE's) that Universities will subscribe to the HEaTED project to support, in particular, the development of a self sustaining national technical skills development programme. Your support is vital to the success of the project as an enthusiastic response will make it clear to both HEFCE and our employers that we are serious about addressing the skills issues in both the long and short term.

STOP PRESS

IST/Heated – Project Update

www.istonline.org.uk/HEATED/heated.htm

We have just heard that we have been successful with our latest bid (£220K) to HEFCE, which will allow us to further develop the work commenced in the current project, as well as consolidating the relationship between HEaTED and the IST. The three year project will commence in September with the main thrust and priority being to establish an extensive technical/specialist skills development programme. This programme will be based on needs already indicated in the HEaTED survey of 2006 as well as future requirements which will be identified by the Technical and Staff Development communities.

Alongside this key component of the new project, work will continue on a number of important fronts including:

- Further development and promotion of the CPD award.
- Continued development of the VLE, including inputs from the various HE discipline groups.
- A review of the HEaTED questionnaire and a second survey early in 2009.
- The organisation of a second conference in 2009/10 to update the Technical/Specialist and Staff Development communities on the projects progress and to seek their views.

It is expected that the above areas of work will generate/identify other issues that will require our attention, as we work towards a self-sustaining organisation that will identify, administer and meet the needs of technical/specialist staff in HE. The project will be overseen by a steering group who will be appointed once we have an Executive Director in post. I have been requested by the current project manager, Matt Levi, to undertake the recruitment process and to that end, criteria will be drawn up over the next few weeks for the post of Executive Director and Skills Development Officer, which will both be widely advertised vie appropriate mailbases and web sites. These two posts will initially be part-time positions and could be secondments from within the sector.

This new funding really does mean that we will be able to make considerable progress over the coming months in the priority areas already identified by the technical staff community and we will, of course, continue to keep you informed as the project progresses. In the meantime, we trust that we can rely on your continued support and particularly your assistance, if required.

Kind regards

Bob Hardwick (Project Consultant)
r.c.hardwick@sheffield.ac.uk

Drug Development and the Cost of Medicines

Mark Timmis

Introduction

The development of new drugs and medicines is misunderstood at best and a black art at worst, even to those in the pharmaceutical industry outside of research and development.

The perception the general public has is that of spectacle-wearing grey-haired scientists, working in the back of a hospital or laboratory on mysterious substances of plant origin with the aim of finding a cure for all ills. This image could not be further from the truth.

What I would like to describe to you here is the process by which chemical compounds are identified as candidates to become drugs and ultimately medicines and relate this to the cost of modern medicines – the later being almost incomprehensible to much of the public and the medical establishment, especially when you consider that a vial of 'clear liquid' to be injected can potentially cost upwards of four figures.

Economics of healthcare and the profitability of the pharmaceutical industry

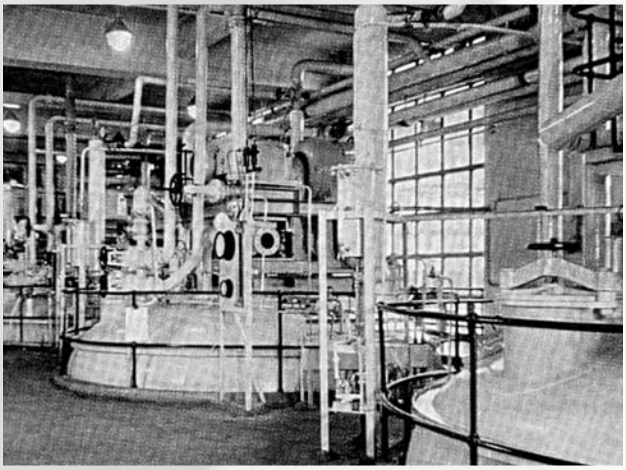
For the pharmaceutical industry to remain profitable and in business, it must develop new drugs and produce new medicines. The business of the pharmaceutical industry, like it or loath it, is basic economics in that products, namely medicines, must be developed to fill the needs of a market, or patients. This may be straightforward. However, the costs of developing new medicines increases year on year but there is also an opposite downward pressure on health costs from Central Government with the latter becoming increasingly reluctant to foot the bill. This is compounded by the increasing health demands and expectations of an ageing population.

Few people realise that from the time a new chemical is first synthesised or identified in the test-tube, the manufacturer has only 20 years of patent life to recoup the costs of development. This means that after 20 years the patent expires and generic companies can then sell the medicine, often at a greatly reduce price, almost overnight severely reducing sales of the original groundbreaking brand medicine. This may be good news in the short-term for the country's health service in reducing costs, but it limits the time a company has to recoup its investment and so potentially hinders further drug development.

With the ABPI (Association of the British Pharmaceutical Industry) estimating the average cost of developing a new medicine from test-tube to market being in the region of £650 million, 20 years is not long to gain an income from a medicine especially when you consider the extensive development time that eats into it.

Why is development so costly?

Out of many hundreds of thousands of potential drug compounds purposely synthesised or identified in a lab, probably less than a hundred or so will have the potential to become medicines—and only one or two of these are ever likely to reach the market.



The manufacture of antibiotics by fermentation

There are many reasons why lead drug compounds are not developed. Some may fail simply because they cannot be effectively manufactured in large quantities. A compound may not be developed because its chemistry will not allow it to be easily dissolved or be stable for any length of time. Compounds that are coloured also tend not to be developed. This is before any toxicity studies have been carried out. Let us look at the drug development process.

In vitro work

Typically, synthesized compounds are added to in vitro systems such as tissue cultures or as part of receptor binding studies. Looking at what receptors or targets the compound will bind to may give an indication of what diseases the compound could potentially treat. For example, many nucleoside analogues have been synthesized over the years with the potential of treating many different diseases. Binding studies, carried out to measure the potency of these compounds at inhibiting nucleoside reverse transcriptase, an enzyme needed by the HIV virus to enable it to replicate, may help to combat progression of the disease through inhibiting this enzyme.

Animal studies

The use of animals in the development of drugs raises strong emotions in many people and is a very sensitive issue.

Some animals are used to look at toxicity and aspects of pharmacokinetics. The issues surrounding this are how far such results can be extrapolated to human physiology. Current opinion is that although cell systems and in vitro studies, as discussed above, can provide much information (and certainly cut down on the use of animals), they cannot totally replace testing in complete animal systems.

Once a compound (now termed a drug) has reached this point and made it into animal studies (termed pre-clinical development), if it cannot be easily metabolised or excreted (removed) from the animal, then further development is unlikely.

Animal models. What is possibly more contentious is the use of certain animal models. This is when a particular animal such as a mouse or rat has been produced through mutations and selective breeding to bring out particular traits or condition that mimic human disease. Looking at the effects of certain drugs on these animal strains may help in the development of medicines for the equivalent human condition.

Phase I, II, III and IV development

Once passed through animal testing, the drug enters phase I development – this is when the drug is administered to the first human volunteers. Valuable information can be gained here especially about the pharmacokinetics. Absorption, distribution, metabolism and excretion of the drug must be studied and characterised. When tested in human volunteers, the drug must be metabolised to simpler compounds and certainly to nothing toxic. All these metabolites must also be tested to ensure they themselves are not toxic and should ideally be inactive. If metabolised in the liver, it must not increase liver activity or cause liver toxicity. If excreted via the renal route, they must also be not toxic to the kidneys. Phase I studies also give the first indication of what a dose will be.

If these hurdles have been passed then the drug may eventually reach patients with the disease the drug is aiming to treat (phase II development). The numbers of patients treated in these studies will only be small, usually involving less than a hundred subjects or so, but will be the best indicator if development is to continue. If results here are positive, phase III trials in larger numbers of patients will be carried out. This may involve hundreds or even thousands of patients depending on the disease. With a favourable response, the company concerned will apply for a Marketing Authorisation to allow the drug, now termed a medicine, to be promoted to the medical profession.
If successful, the medicine will reach the market.

Ideal attributes of a drug for it to become a medicine:

- good, reliable and reproducible pharmacokinetics in the population
- half-life that will allow once-daily dosing but without remaining in the body for too long
- small number of simple metabolites
- easy (and simple) to manufacture in large scale

The value of serendipity …

Few people realise that many widely used medicines have originated from chance observations or serendipity.
This is at odds with the general perception people have of scientific development and a designed approach to medicine. Probably all medicines that have been available for more than 30 years or so have a certain amount of serendipity associated with their discovery. Here, I would like to show you a few examples of this.

The origin of the anticoagulant warfarin is a perfect example of how many older drugs were often discovered. During a particularly wet summer in Canada about 60 years ago, a farmer harvested sweet clover, intending to use it for animal fodder. However, because it was damp, it became mouldy and subsequently became spoiled. Unfortunately, when cattle fed this sweet clover were later de-horned, they bled to death. The *Wisconsin Alumni Research Foundation* (or WARF) in the US saw this response and subsequently developed the anticoagulant WARFarin from an extract of the clover. This group is still actively involved in drug discovery today, and warfarin and its relations, coumarins, are still very widely used.

During early trials involving treatments for tuberculosis in the 1940s, it was seen that some patients appeared to feel much better regardless of their TB status. From these observations, an early class of antidepressant was developed; the MAOIs or monoamine oxidase inhibitors – still in use today.

At about the same time, in trials looking at the sulphonamides, early antibacterial agents, it was noted that urine outflow was increased in patients taking these medicines. This led to the development in 1957 of one of the first true diuretics, acetazolamide, used to rid the body of excess fluid. Various chemical changes made the drug more effective, leading to the development of chlorthiamide, from which modern loop diuretics such as furosemide evolved.

Researchers in other early trials with sulphonamide antibacterials noted that patients' blood-sugar fell. This led to the development of the sulphonylureas, still the main drugs used to treat type-II diabetes.

About 30 years ago, a company investigated a traditional remedy from the island of Madagascar. The local people there used an extract of the Madagascan periwinkle (*Catharanthus roseus,* formerly Vinca rosea) to treat what appeared to be diabetes. Unfortunately, when this was tested in rabbits, the animals developed infections and died. The test material had produced a fall in the rabbits' white cell counts which reduced their ability to fight (ultimately) fatal infections. A scientist on the team suggested that this extract might be useful in treat diseases where white cells grow out of control, leukaemias. The vinca alkaloids (vincristine, vinblastine and vindesine) are now the mainstay of treatment for these serious conditions.

Probably the most famous recent example of serendipity is sildenafil or *Viagra*. This medicine, from a group called PDE-5 inhibitors (phosphodiesterase inhibitors), was originally investigated by *Pfizer* for various cardiovascular conditions. It was only after the trial subjects were interviewed and the men in the trials reported certain unexpected 'side-effects', that sildenafil was investigated for erectile dysfunction. The rest, they say, is history!

The value of chance observation is incalculable, although it might seem bizarre that so many drugs have depended on this for their development. However, this also shows the importance of monitoring side-effects and pharmacovigilance during clinical trials and when a medicine is marketed (post marketing surveillance).

More rational design

Combinatorial Chemistry is a more modern approach to drug discovery. A promising compound, or lead compound, is identified and many hundreds of variants or analogues are synthesized in minute quantities. These 'samples' can then be rapidly tested in *in vitro* systems. Over time, companies build up large compound libraries both as 'actual compounds' as well as 'virtual' libraries of theoretical substances.

Biotechnology

Although not the panacea it was expected to be in the 1980s, biotechnology has produced a number of remarkable drugs. The biotechnology industry started by inserting genes for macromolecular drugs such as insulin or growth hormone, for example, into bacteria or fungi, and producing them through fermentation rather than through extraction from animal material as was formerly done. This process allows the production of very pure drugs, eliminating the risks of animal material or worse still, viruses, contaminating the final product.

Typically, modern biotechnology involves a receptor, cell marker or biological molecule being identified and a monoclonal antibody being raised to it. This may block or enhance a biological process.

Genes can now be inserted into animals giving rise to 'transgenic animals' where the drug in question, produced from the gene, can be excreted into the animal's breast milk for example. Although it has been said before, this is the way forward to produce precisely tailored medicines, possibly even designed for an individual patient – but this is still a long way off.

Conclusion

Drug development is a long and costly process but modern health services are becoming increasingly reluctant to pay for new innovative agents.

From test-tube to prescription may take anything up to 10 years or more. The development work involves a tremendous amount of investment, both in time and money, and is something that seems to have escaped the minds of many company shareholders and even medical professionals! The pharmaceutical industry remains by far the biggest investor in drug development.

From good chemistry to well designed clinical trials; from large-scale production to excellent marketing and promotional expertise; from continued safety monitoring to providing continual follow-up support; these skills are something that the pharmaceutical industry excels at. It all costs a considerable amount of money and we should all be proud of what has been accomplished by the pharmaceutical industry.

Contrary to popular belief, this is the reason why medicines, especially modern medicines, are considered to be so expensive.

More information

For more information or references to the above, please contact Mark Timmis at **timmis35@aol.com**.

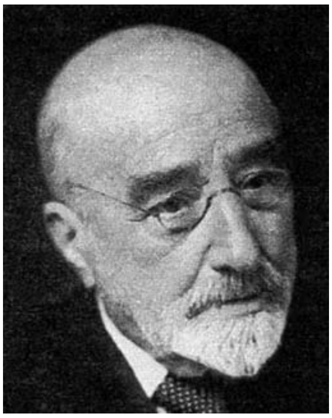
Mark graduated in pharmacy at Nottingham University in 1989. He worked as a hospital pharmacist before moving to an editorial position at the Royal Pharmaceutical Society of Great Britain. In 1997 he took a leap and moved into Medical Information in the pharmaceutical industry where he still works. He is a freelance writer and is co-editor of PIPELINE, a newsletter for medical information and pharmacovigilance professionals working within the Industry.

From Tobacco to Test Tubes – The Gallenkamp Story

PART ONE – THE YEARS UP TO THE GREAT WAR

Alan Gall, IST Archivist.

To the south of St. Paul's Cathedral runs Queen Victoria Street. Commissioned in 1861, this major London thoroughfare soon became a busy commercial area that attracted numerous residents. By 1880 the south side alone housed over 400 businesses, between them covering a multitude of different professions. Some acted as outposts for distant foreign enterprises, such as the 'City of St. Petersburg New Waterworks Company' and 'The Haider Pasha to Ismid Railway'. Others were local traders, sales representatives for provincial manufacturers or professional-service providers. All were eager, for one reason or another, to have a base in the UK's capital city. Amongst these varied emporiums stood number 35c, the modest premises of a cigar merchant called A.Gallenkamp & Company. From this inauspicious beginning in the tobacco trade developed what would become a giant in the world of scientific equipment suppliers. This is the story of how it all came about.



Adolf Gallenkamp as pictured in the 1981 Gallenkamp catalogue)

Adolf Carl Gottlieb Gallenkamp, first son of Carl Wilhelm Gallenkamp and Bertha (née Grabow), was born at Duisburg, in the province of Rhenish Prussia, on 13th June 1848. The Germany of today is, of course, a very different place from that of Adolf Gallenkamp's youth. Duisberg then came under Prussia before Bismark united the disparate German states under one rule. The city was noted for its steel and tobacco industries, the latter suggesting the reason for Adolf's later involvement with the cigar business. A notable citizen of Duisberg was the famous cartographer Gerardus Mercator, who lived there from 1552 to 1594.

It is believed that Adolf arrived in England around 1872 when in his mid-twenties. At some time towards the end of that decade he began trading from the Queen Victoria Street premises in partnership with two other Prussians, Oscar Werth and Gustav Krussmann under the name of G.A.Krussmann & Co, importers of Havana cigars. Gustav Adolf Krussmann, the eldest of the three, came from the town of Elberfeld, now part of Wuppertal, near Dusseldorf. This is south east of Duisberg, Gallenkamp's hometown.

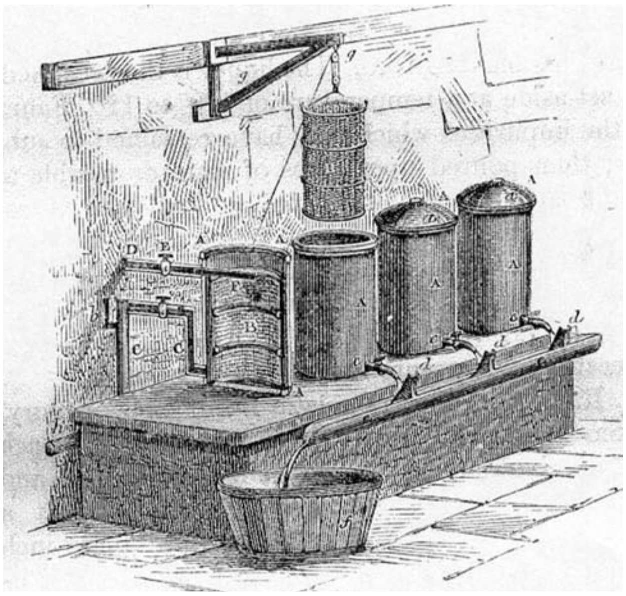
In 1879 the partnership was reduced to two when Krussmann resigned, although the trading name did not change to A.Gallenkamp & Co until 1880. Gustav Krussmann had another commercial interest, the merchants Bauer, Krussmann & Company. He failed to accumulate any significant wealth from these enterprises and ended up as a publican running the Star & Garter in Dorking, and later the Camden Hotel, Pembury, Kent. Gustav's son, Leo, emigrated and became a partner in a large American jewellery manufacturer, Trifari, Krussman[n] & Fishel (inventors of an alloy called Trifanium that looks like gold). Little is known of Oscar Karl Felix Werth who left the cigar business shortly after Krussmann to earn his living as a teacher.

Captain Shaw, chief of the Metropolitan Fire Brigade, reported on a series of fires that had damaged property in London during the early part of December 1879. One of the most serious incidents was a gas explosion at 35b Queen Victoria Street, the shop belonging to a tailor called T.A.Windt. The damage extended to Adolf's premises next door at 35c but not sufficiently, it would seem, to halt his cigar business. Fires were not unusual in an age of illumination by oil and gas lamps, before electricity generation became commonplace.

Adolf had married Charlotte Mary Errington, a farmer's daughter from Northampton, on 3rd September 1878. They had three daughters: Bertha Ellen born 1880, Edith born 1881 and Dorothy born 1884. The only son, John Wilhelm, was born in 1883. All survived into adulthood, except Dorothy Gallenkamp who died at the age of six in 1890.

Without the support of any partners, Adolf's operation was on a small scale. In 1881 he had just two employees: a salesman called Moritz Schweitzer and a young man to assist in the shop. In about 1882 Gallenkamp moved northwards to 30 Holywell Lane, off Shoreditch High Street, near Bethnal Green Road. With this move appears to have come a change in profession to that of a gelatine (also called gelatin) importer. Gelatine had long been in use for making glue and as a foodstuff. After 1871 it found an important application in the preparation of dry plates for photography. This critical development reduced the photographic exposure time significantly. What had been a primitive industry suddenly had the impetus to begin expanding, and many small gelatine factories were established across Europe. The method of extraction from animal parts (hoofs, horns, hides and bone) is shown, with the equipment that would have been in use during the

1870s. Robert Koch showed in 1881 that gelatine could be used as a gelling agent with meat extract to produce a medium for culturing bacteria. This application was soon superseded when Fannie Hess, a technician working in Koch's laboratory, found that the polysaccharide, Agar had far superior properties.



GELATINE EXTRACTION PLANT

(A) Cast-iron vessels	*(a) Lids fitted with valves*
(B) Basket containing bones	*(b) Thermometer in steam line*
(C) Steam pipe	*(c) Stopcocks*
(D) Water pipe	*(d) Tin-plate gutters*
(E) Water tap	*(e) Discharge conduit*
(F) Tube, perforated with small holes	*(f) Collection cistern*

Engraving from Chemistry as Applied to the Arts & Manufactures (c.1875). Courtesy of John Barlow

The Gallenkamp catalogue of 1981 relates that Adolf ran his cigar shop at Cross Street where students and staff from the City & Guilds Technical College called in to buy their tobacco supplies. Knowing his German connections, customers asked Adolf to bring over some German-made laboratory glassware with cigar consignments: 'What began as an occasional favour developed and prospered'. This is a nice story, but if true the events could not have taken place at Cross Street. By 1886, A.Gallenkamp & Co were advertising as chemical apparatus & thermometer makers, agents and consignees at 30 Holywell Lane. Not until the following year did they move to Cross Street, having left the cigar business behind at 35c Queen Victoria Street. Furthermore, number 35c (if that was the location where the importation of apparatus began) would not have been a very likely stopping-off point for anyone attending the College.

After the move from the St. Paul's district, subsequent changes of address were kept within a small area roughly centred on Finsbury Square. Cross Street ran between Wilson Street and Finsbury Pavement and now goes under the name of Lackington Street. Gallenkamp occupied numbers 2, 4 and 6 (all of which have long since been demolished). These buildings were quite small so, perhaps for that reason, relocation followed after some 9 – 10 years.

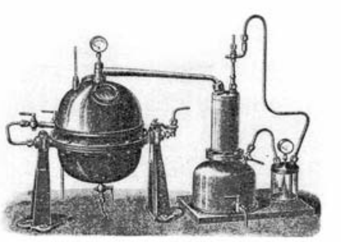
John Orme & Company, scientific apparatus makers, used number 6 after Gallenkamp moved out but became bankrupt. The son of John Orme, Alfred Charles Orme, moved to Manchester in about 1903 where he set up his own glassblowing company. This became Orme Scientific at Middleton, which closed down only recently

By 1900, Gallenkamp had transferred to Sun Street and it was at numbers 19 and 21 that A.Gallenkamp & Company Ltd was incorporated on 31st December of that year. Adolf took up the position of Governing Director on a salary of £300 per year and Harry Grant Jarrom was appointed Managing Director on £200. Jarrom later married the boss's daughter, Bertha Ellen Gallenkamp. The stock manager at that time was James Davies, someone who would feature prominently in the later fortunes of the company.

Sun Street once carried on from Finsbury Square all the way to Bishopsgate. The arrival of the railway, first bringing Broad Street Goods Station then Liverpool Street Station, reduced its length by nearly two thirds. A short stretch of the street came within the borough of Finsbury but the rest, including Gallenkamp at 19 & 21, fell within the boundary of Shoreditch. Adolf held a lease on the Sun Street property and rather than assigning this to the company in 1900 had arranged for an underlease to be created. This guaranteed him a sum of £500 per annum.

19 & 21 Sun Street, London. From the 1910 Gallenkamp catalogue

By the time the 1902 Gallenkamp catalogue appeared in print there were sufficient products to fill 634 pages of A5 size. There is no indication that any of the items on offer were yet Gallenkamp-made. Some of the equipment is easily identifiable: gas burners and accessories from Fletcher, Russell & Co Ltd of Warrington, the balances of Becker's Son & Co from Brussels, Hearson's British made ovens. All of the goods were either imported or made by one of the many UK manufacturers. Certainly, the ceramics and glassware were mainly German, a situation that came to an abrupt end with the start of World War One. Thereafter, and for some years beyond the end of hostilities, it became necessary to promote British-made items.



Vacuum distillation apparatus from the 1902 Gallenkamp catalogue. Courtesy of John Barlow

ESTABLISHED 1880.

A. GALLENKAMP & Co., Ltd.
19-21 SUN STREET, FINSBURY SQUARE, LONDON, E.C. 2

British Capital
British Controlled

Directors—
H. G. Jarrom
J. Davies
F. Dixon

BRITISH MADE GLASSWARE.
Beakers, Flasks, Basins, Funnels, Bell Jars, Aspirators, Condensers, Hydrometers, Thermometers, Etc.

BRITISH MADE PORCELAIN.
Basins, Crucibles, Casseroles, Dye Pots, Etc.

BRITISH MADE FILTER PAPERS.
To 'replace' the various S & S qualities.

BRITISH MADE NICKEL WARE.
Basins, Crucibles, Spatulas, Etc.

Prices on Application.

Telephone—LONDON WALL 1404 & 1405.
Telegrams—"GALLENKAMP, FINSQUARE, LONDON."

Gallenkamp & Co assuring the public in Nature (1919) that the firm was totally British

The year following the issue of the catalogue Adolf applied for Naturalisation. This procedure required the submission of personal references, which were then checked by the Criminal Investigation Department of the Metropolitan Police. Sergeant Thomas Earnshaw reported: 'The Sureties speak well of the applicant as a respectable man and I can see no reason to doubt their statements.' At this time, Adolf lived at 106 Mount Pleasant Lane, Upper Clapton and his son John (Jack) at the small village of Trimley, in Suffolk.

ADVERTISEMENT AND TERMS.

This Price list cancels all former lists. The prices are subject to market fluctuations.

Breakage in transit. We do not hold ourselves responsible for breakage or damage in transit, every care being taken to ensure safe delivery of goods. In the event of breakage or damage a claim should be **immediately** sent to the Railway Company or Carrier.

Payments, if not specially otherwise arranged, Cash with order or satisfactory London reference, a Cash discount of 2½ % off invoice amount, will be allowed on payments within a month from date of invoice.

Colonial and Foreign Orders must be accompanied by a remittance, or instructions for payment in London on delivery of the Bills of Lading, etc.

All Goods marked „in Germany„ and „in Bohemia" can be shipped from any Continental Port, at the reduced prices given.

The prices marked „in Germany" and „in Bohemia" are subject to carriage from the glass works of our houses. Packing Cases for goods bought at those prices are not returnable and cannot be allowed for. They are charged at cost prices.

From four to six weeks are required for supplying direct from the works in Germany, and from 3 to 5 months for supplying direct from the works in Bohemia.

Packing Cases and Boxes for Goods from London to any part of the United Kingdom can be returned and will be allowed for in full, if returned carriage paid, *when actually received by us* in good condition, with all the packing material, *and within a fortnight after receipt of goods.*

Graduated Apparatus. We supply in addition to the cheaper but carefully selected graduated Apparatus, most carefully adjusted burettes, flasks, measures bearing the stamp **„Normal"**. **These are all tested and guaranteed correct.** We also stock such apparatus stamped with the Reichsanstalt stamp.

This List gives a selection of Apparatus in general use, but any other size or shape can be made to order. **Glass apparatus not quoted with a price „in London"** we do not stock as a rule: we can obtain it to order from our German houses in one of our import cases and charge share of risk and carriage on price. Or a quantity of glass or porcelain goods might be ordered together for supply direct from the works at the so much lower „in Germany" or „in Bohemia" rate. Carriage and packing will be charged and empties are not returnable nor can any allowance be made for them.

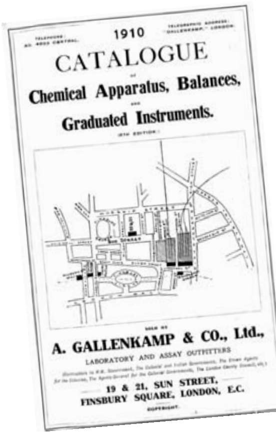
When ordering for supply direct from the Porcelain Works. as much as possible should be selected for delivery either from Berlin or Thuringia, if orders are small: as too much splitting of orders might make cases too small and consequently the two carriage expenses too high proportionately.

Cheques to be crossed London & South Western Bank, Finsbury Pavement.

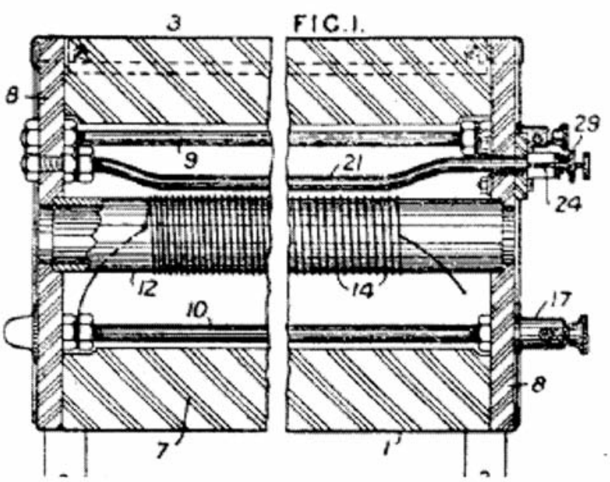
A. GALLENKAMP & Co. Ltd.,
19 & 21, Sun Street, FINSBURY SQUARE
LONDON, E. C.

London, 1902.

Around 1910, Gallenkamp started offering fused Silica Ware. Up to about 1904, the process for manufacturing small vessels in this material did not lend itself to commercial production. Experiments by Robert Hutton at the University of Manchester showed that it could be accomplished in an electric furnace and this work resulted directly in the establishment of the'Vitreosil' brand of laboratory ware made by the Thermal Syndicate of Newcastle-upon-Tyne. Professor Hutton was more than a little put out when the Thermal Syndicate published a commemorative booklet in 1956 without proper acknowledgement of his fundamental contribution.



Gallenkamp's first venture into manufacturing, at least on any reasonable scale, seems to have been made with the establishment of a factory at Chalfont St. Peter in 1911 for the production of electric furnaces.



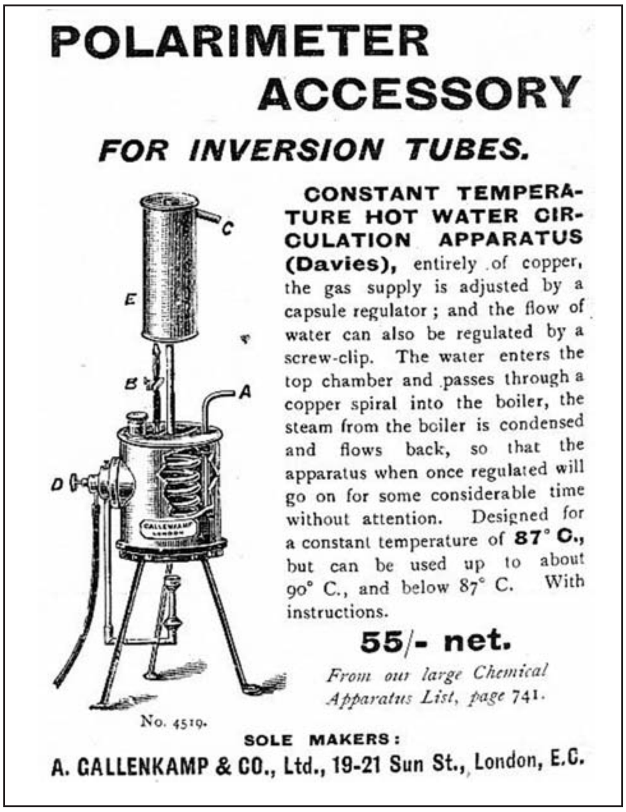
Electric Resistance Furnace patented by James Davies in 1914, No. 10,415

James Davies, who had become a director in 1902, took a technical interest in ovens and in 1914, just months before the outbreak of war, applied for a patent entitled 'Improvements in and relating to Electric Resistance Furnaces'. This described the construction of an oven using tie-rods that also acted as conductors of current to the heating elements. One feature was the ease with which the body could be dismantled to replace burnt-out elements. These ovens were offered for sale in various configurations by 1916.

An earlier furnace due to Davies was based on the simple idea of surrounding a Bunsen flame with an insulated metal tube. The combination, it was claimed, could heat a crucible up to 1050° C. Competitor, Townson & Mercer Ltd, offered a similar device called the 'Midget Furnace' at seven shillings.

Advertisement in Nature from 1912

Another site occupied by Gallenkamp was just off Scrutton Street. This consisted of a group of small buildings numbered 6 to 12 Providence Place, next to a London County Council school, a few streets to the north of Finsbury Square. The purpose of these buildings has not been definitely identified but they were probably used for the production of glassware, which is known to have commenced in 1913 at a location somewhere other than Sun Street. Part of this area was badly damaged during the Blitz and Scrutton Place vanished with post-war redevelopments. A link with the past is 'The Old King's Head' pub that still stands on Holywell Row and Scrutton Street, opposite to where the old school stood.



Designed by James Davies and advertised in Nature during 1913.

Even though he was a naturalised British subject, Adolf Gallenkamp's German origins put him in a difficult situation as the war progressed. Businesses with foreign-sounding names were on the defensive, worried that they would fall victim to the mounting anti-German feelings. Some firms placed advertisements assuring customers that no connections with the enemy existed. One of Gallenkamp's fellow suppliers, F.E.Becker & Co, issued a statement in 1915: '…an all-British firm employing all-British labour, whose capital is and always has been entirely held by Englishmen, who have never employed a single German or Austrian, naturalised or otherwise…' Adolf resigned as a director and the company was at pains to point out that the remaining directors: Harry Jarrom, James Davies and Frank Dixon, were all British. However, Adolf retained his majority of shares in A. Gallenkmap & Co Ltd. Harry Jarrom held the next largest allocation of shares, followed by James Davies. Frank Dixon had only a small holding.

Because they were contractors to the War Office, Ministry of Munitions and the Colonial Governments, A.Gallenkamp & Co didn't lack for custom during the war years. Pre-war, the yardsticks in performance for laboratory vessels were the German-made Royal Berlin for ceramic basins and crucibles, and Jena for heat-resistant glassware. Kavalier's Bohemian glass also enjoyed popularity.

In their place were now offered such products as Reijmyre resistance glass from Sweden and Record brand porcelain. The range of filter papers from Max Dreverhoff of Dresden, for which Gallenkamp had the agency, was replaced by British equivalents.

Adolf never resumed his role as a director of the company. In any case, by the end of the conflict he had passed his 70th birthday. For reasons unknown, his son John had emigrated to Canada in 1912 rather than get involved with the business. Daughter, Edith, married Sydney Tappenden in 1910 but her husband did not take on any role in the organisation. However, Harry Jarrom continued the family connection (by marriage) for many years and his name is remembered to this day because of the 'Harry Jarrom Trust Fund'. This provided a 'nest egg' for long-serving members of the company and will be described in a later episode.

Adolf Gallenkamp lived to the age of 89, spending the last years at his home 'Littlecot' on Flower Lane, Mill Hill, now uncomfortably close to the M1 motorway.

Nearly sixty years of trading had taken his company to the forefront of an industry entered, perhaps, almost by chance. The pre-Great War dominance of Britain's chemical manufacturers, and the need to keep their laboratories stocked, contributed in part to the expansion. Such companies as Brunner, Mond & Co Ltd and Nobel Industries Ltd, yet to become founder members of Imperial Chemical Industries, were at the head of their respective business sectors in terms of both domestic and over-seas trade. Heavy-chemical production boomed, only in the dyestuff industry did this country seriously lag behind (the major manufacturers were in Germany). Of course, competition from other laboratory suppliers was ever present. In the north, J.W.Towers had been founded in 1882 at Widnes. Up and coming was the Birmingham supplier Standley, Belcher & Mason, established in 1906. Closer to home were the London based concerns: John J.Griffin & Sons, Townson & Mercer, F.E.Becker & Co. Most of these, as we will see, would later become part of the Gallenkamp empire by various routes.

Acknowledgements

Thanks are due to:
Pep Gallenkamp for details of the family history.
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John Barlow.
Eric Borradaile-Jones.
Doug Cutts.

Research costs sponsored by SDA Electronics Ltd, Salford.

Appeal for Information

In 1964 there were a total of sixty-seven laboratory suppliers listed as wholesalers that James A. Jobling would supply directly with Pyrex glassware. IST Archivist, Alan Gall, is researching the history of all of these businesses to discover how they began and if they still exist today. Would any members who have information/artefacts relating to any of the following please contact: alangall@hotmail.com or the Institute

LAB SUPPLIERS

Aimer Products Ltd, London

Analytical Supplies Ltd, Derby

Anderman & Co Ltd, London

Astell Laboratory Service Co Ltd, London

Andrew H.Baird Ltd, Edinburgh

Baird & Tatlock (London) Ltd, Birmingham, Chadwell Heath & Manchester

A.A.Brown Ltd, Sheffield

Camlab (Glass) Ltd, Cambridge

Collier Scientific Ltd, Chistlehurst

Ralph Cuthbert Ltd, Huddersfield

Davison & Hardy (Laboratory Supplies) Ltd, Belfast

T.Dryden Ltd, Swansea

Electricals (Laboratory) Ltd, Newcastle upon Tyne

Eureka (Scientific) Ltd, Ilford

George Farley & Sons, Ponders End

Ferris & Co Ltd, Bristol

H.Ferryman Ltd, Southhampton

W.Finlayson, Stockton-on-Tees

Fisons Scientific Ltd, Loughborough

W.G.Flaig & Sons Ltd, Broadstairs

A.Gallenkamp & Co Ltd, London, Manchester, Stockton, Uxbridge & Widnes

Glass of Mark Ltd, Northwich

D.R.Grey Ltd, Norwich

Griffin & George Ltd, B'ham, Bristol, Glasgow, Manchester, Newcastle & Wembly

Philip Harris Ltd, Birmingham

Charles Hearson & Co Ltd, Liverpool & London

Arnold R.Horwell Ltd, London

Hospital & Laboratory Supplies Ltd, London

William Jarvie Ltd, Coatbridge

Jencons (Scientific) Ltd, Hemel Hempstead

R.W.Jennings & Co, Nottingham

Kernick & Son Ltd, Cardiff

Laboratory Apparatus & Glassblowing Co, Manchester

Laboratory Glassblowers Co, High Wycombe

Laboratory Glass Industry (Clapton) Ltd, London

McCulloch Brothers & Wilson, Glasgow

McQuilkin & Co, Glasgow

Medical & Laboratory Supplies Ltd, Derby

Middleton & Co Ltd, Middlesbrough

C.L.Muller, London

National Glass Industry (Tottenham) Ltd, London

W.B.Nicholson (Scientific Instruments) Ltd

Northern Media Supply Co, Hull

Oakes, Eddon & Co Ltd, Liverpool

Orme Scientific Ltd, Manchester

C.E.Payne & Sons Ltd, London

J.Preston Ltd, Sheffield

Pyrometric Equipment Co Ltd, Market Harborough

Reynolds & Branson Ltd, Leeds

John Richardson (Surgical) Ltd, Leicester

River Chemical Co Ltd, Nottingham

Scientific & Chemical Supplies Ltd, Sedgley

Scientific Furnishings Ltd, Poynton

Scientific Glassblowing Co Ltd, London

Scientific Glassblowing Co, Manchester

Scientific Supplies Co Ltd, London

Smith, Nichol Co, Aberdeen

Southall Brothers & Barclay Ltd, Birmingham

F.Storey Ltd, Belfast

Sutherland Thomson & Co Ltd, Wells

Thomson, Skinner & Hamilton Ltd

Townson & Mercer, Croydon, Edinburgh

Urwin & Co Ltd, Newcastle upon Tyne

J.W.Turner & Son, Liverpool

Universal Glass Co, Manchester

Vicsons Ltd, Harrow

R & J Wood, Paisley

The Development of Science and Technology in the UK and abroad

Derek Sayers FIScT, Simon Fairnie FIScT and Philippa Nobbs FIScT

How it all began

Before the Great War of 1914-18, the technician as we know today was almost unknown and technicians in University laboratories were rare. An academic researcher would have had to help him either a 'Steward' or a 'boy', who was very much a college servant and in some places was often known as such. Indeed back in 1851 a chemist named Mansfield working near what is now St Pancreas area of London had an accident where both he and his assistant were burned. Mansfield was taken to fee-paying Middlesex Hospital whereas his 'assistant', Nicholson, was taken to the Free Hospital where his treatment would have been minimal.

An assistant was a 'Jack of all Trades' - who polished the benches, cleaned and repaired the glassware and was generally the 'hands' of the professor or academic worker. This was often still the case right up until the late 1950s.

In 1912 'The Pathological Laboratory and Bacteriological Laboratory Assistants Association' was formed which later became the Institute of Medical Laboratory Technology; now called the Institute of Biomedical Science. Note the word 'Technology' has now been replaced by 'Science'. This organisation caters for workers in hospital, clinical and research laboratories. In 1929 the Association of Scientific Workers (AScW) came into being as a Trade Union although science technicians were not welcomed to join until after 1940.

In 1942, the AScW set up a committee on 'Technician Training' of which Professor Winton of the Pharmacology Department at University College London was a leading light. In 1946 seven technicians independently formed themselves into the 'Science Technologists Association' and campaigned to achieve a wider and national interest in their new creation which they saw as an opportunity of furthering the training and status of technicians especially those in the sciences. Professor Winton gave the newly formed Association great support and did his best to persuade technicians to accept the idea of joint technician and academic committees and was keen to set up training courses for technicians as he appreciated their skills in his own Department.

Science Technologists Association (STA)

In 1948, 154 technicians expressed an interest in joining the Association and on 10th July 1948 the 'Science Technologists Association' formally came into being – and was the forerunner of the Institute of Science Technology, now known as the Institute of Science and Technology.

Institute of Science Technology (IST)

By 1954 the membership of the STA was growing fast and it was agreed that there should be a Certificate of Incorporation and in the latter part of that year the Institute of Science Technology was formed.

During the 1960s, the IST was growing well and by the end of the decade it was at its peak of membership with over 4000 members. London alone had 1,400 members and there were Branches in all the major university cities, as well as members from abroad, mainly from the British Commonwealth Nations. In the 1970s the science technical world began to change. In the United Kingdom there were new universities opening and, for young people, a college degree was thought rather better than a technical qualification, as an academic post would attract more money and better career prospects.

The 'technician' was being replaced by the 'technologist' or 'scientist' with the more practical 'hands on' skills such as glassblowing and photography being forgotten. In the laboratory young academics were employed in a technical capacity whilst they were studying for their academic degrees; which, when achieved, led to them being given an academic post. Hence the technician had become an untrained student. At the same time there was also a greater restraint on money to universities and it was the technical posts that were the first to suffer from lack of funding. All this meant that in many universities in the UK the skilled technicians were those who were trained in the 1960s; consequently the membership of the IST in the UK began to fall. It was not until the 1990s that the British Government began to realise that there was a serious shortfall in technical skills which need to be addressed. They introduced the National Vocational Qualification (NVQ) where the vocational skills could be assessed. Academic courses in technology were also set up along with Modern Apprenticeship frameworks for Laboratory Technicians. Unfortunately it has not yet reversed the damage done in the 1970s and 80s.

IST Training and Qualifications

Training and qualifications available to technicians have changed over the years. In the 1960s and 1970s, technicians could attend day-release courses leading to the Science Laboratory Technician's Certificate awarded by the City and Guilds of London Institute (CGLI) in conjunction with the IST. By the early 1980s, day release had become a thing of the past and these courses disappeared.
TEC certificates (later becoming BTEC) were introduced but these did not teach skills or train technicians. The IST provided the opportunity for technicians working in

specialist areas to gain a Higher Diploma and these continue to be used, especially overseas. In 1981, the IST published a manual for the training of science technicians in educational and research laboratories. This was updated and expanded in 1994 when the IST launched its Core Vocational Qualification (CVQ) and, later, the Preliminary Vocational Qualification (PVQ). These qualifications were supported by training exercises and were offered by registered centres around the country.
In 2005, the IST began to work with the awarding body PAA\VQSET in order to convert its CVQ and PVQ to nationally recognised and accredited qualifications.
In 2006, the Certificates in Laboratory Technical Skills at levels 1, 2 and 3 were launched. These are designed to provide underpinning knowledge for the NVQs in Laboratory and Associated Technical Activities and are designated as Technical Certificates required for the current Apprenticeship frameworks.

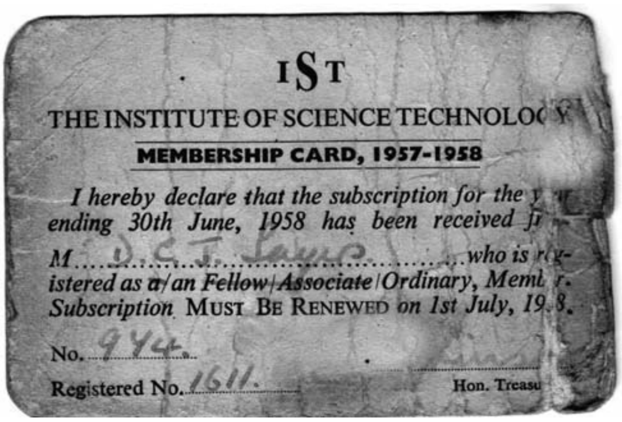
The IST has always been involved in professional standards and qualifications in an effort to provide opportunities for members to demonstrate their capabilities. In addition to working with City and Guilds, it had representatives on the subject committees for TEC and BTEC. More recently, it was part of the groups that devised the National Occupational Standards that led to the NVQs for Laboratory Technicians in Education and in other areas. It was also part of the group that produced the Apprenticeship frameworks.
In the 1980s, the IST introduced a Register of competent practitioners to which technicians could sign up if they met the standards that had been set. In 2005, the IST launched a CPD scheme for technicians, in association with HERaLD, an education consultancy company.

IST Early Education

Derek Sayers (London)
I began work as a Junior Technician in Professor Winton's Pharmacology Department at University College London in the middle of 1954 when the organisation was still called the STA. I was told that I had to begin my studies in laboratory technology immediately. In those days there were no formal courses; the courses were run by members of the STA in their own laboratories mainly in the evenings. It was later in 1954 that the name of the STA was changed to the Institute of Science Technology (IST), at that time this meant little to me all I knew was that I had to study hard if I wanted to become a proper technician. For my basic technician course of three years I had to study the following:

Pharmacology, Physiology, Histology, Chemistry, Physics, Electricity and Electronics, Glassblowing, Photography, Woodwork, Metal and Plastic work and Laboratory design.

As I was working in a Pharmacology Department the first three subjects were specialist; if I had been working in Geology then these subjects would have been different. Each subject was taught for at least one year. It amounted to three nights and one afternoon's study per week. The examinations were set by the IST but had no national status outside the IST. I sat my final examinations in 1957. At the time the examinations were set nationally but the syllabus varied according to where you studied. To overcome this problem the marks at any one place were pooled and the average mark found. This average mark was taken as the pass mark i.e. in theory about half the students would pass. I managed to scrape through becoming a fully fledged ordinary technician or what one might call 'intermediate' technician as I had not studied for my higher final exams and would not be able to progress in my career until this specialist course had been taken. At this time all male teenagers were required to undertake National Service in one of the three armed services.
I decided to 'sign on' as a Regular soldier for three years so I could continue studying. From 1957 to 1960 I served in the Royal Army Medical Corps (RAMC) and studied at the Royal Army Medical College in London gaining a Medical Technology qualification which was entirely different to the Science qualification but similar to that set by the Institute of Medical Laboratory Technology allowing the bearer to work in a hospital laboratory.



On leaving the Army in 1960 I undertook the two year course in my specialist subject - histology and also mandatory laboratory design and management to a higher level. By this time the IST courses had been taken over by the City and Guilds of London Institute whose qualifications were recognised nationally in the United Kingdom. It was about this time that the Government of the United Kingdom decreed that all technicians working in hospital laboratories had to be State Registered thus with a medical laboratory qualification, I became a 'State Registered Medical Laboratory Technician' now called a 'Biomedical Scientist'. In 1983 I wrote a thesis and obtained a Fellowship of the IST. Fellowship of the Institute was, and still is, only awarded to those who have either submitted a dedicated IST thesis, an academic degree with a specific amount of technical innovation, or written a number of scientific papers. On rare occasions Fellowship is awarded to members who have served in a senior position for many years.

Simon Fairnie (Edinburgh)

I started as a Trainee Laboratory Technician in the Zoology Department of Edinburgh University on Monday 28th August 1955. The Chief Technician was Ron Fox, who was a founder member of the Science Technologist Association (STA) and had been elected in July 1948 as its first Honorary Secretary. Also as Secretary of the Examinations Board of the STA he was responsible for drafting the first printed Regulations and Syllabuses for the Institute's Certificate and Diploma Examinations therefore, because of his STA/IST connection and that Edinburgh was a leading centre for technician education all trainees were compulsorily enrolled to study for the IST/CGLI Science Laboratory Technicians Certificate 119. These courses were taught in the science laboratories of a secondary school with some of the classes held in the University Medical School laboratories. The classes held in the school were taught by Chief and Senior Technicians and those in the University by Academic Staff. We were fortunate in Edinburgh as technician education had the full support of the University and often as not our Academic tutors were some of the most eminent scientists of the day who gave us their time and the use of their laboratories and equipment.

These night school classes, which were held three nights per week - no day release then - ran for three hours from 6.30pm until 9.30pm. After three years of study, I gained a First Class pass IST/CGLI intermediate certificate and promotion from trainee to technician. I then embarked on an HNC Biology course during which time the IST/CGLI 735 Advanced Certificate exam in Zoological Techniques was sat as an external candidate. After both certificates were passed and a CGLI Full Technological Certificate awarded a part-time Lecturership and Science Technician course organiser at a local Technical College was taken up. Membership of several of the College Committees followed which subsequently resulted in an appointment to be a member of the Scottish Technical Education Committee (SCOTEC) Biological Sciences Committee and of several of its sub-committees which were set up to rewrite the syllabuses for the new courses to be introduced into Scotland as a replacement for the then existing HNC courses.

Throughout my time in Edinburgh University and subsequently in 1962 when I transferred to be the Chief Technician in the Brewing and Biochemistry Department of Heriot Watt College, now University, I had been a member of the IST progressing from Trainee to Fellow and via membership of the Edinburgh Branch, and with the experience of several terms as a Branch Committee member I was proposed for and elected to Council of the Institute where over the years I have served on many of its Committees. Prior to the change of internal management of the Institute from a Council to an Executive, I was appointed a Vice President which I currently hold

In 1966 Heriot Watt College was given University status soon after which I was elected to the Court of the University on which I served for two terms of three years. During that time and subsequently I became a member of a number of the University sub committees including the Safety, Catering, Staffing, and Buildings Committees.

A promotion to the Academic related grade of Department Administrator was achieved which I held until my retirement.

Philippa Nobbs (Cambridgeshire)

I began work as a laboratory technician at the Isle of Ely College of Further Education and Horticultural Institute in August 1966. Having been told, at interview, that I could study for the City and Guilds' certificate, this turned out to be not available in this part of the world. Instead, I completed A levels in Chemistry and Biology. In the early 1970s, the college itself decided to offer the CGLI lab technicians' certificate and, eventually, I got the chance to complete Part 1. I was bitten by the learning bug, by then, and in order to complete Part 2, I enrolled at Cambridge College of Arts and Technology (which has since become Anglia Ruskin University) to study the Chemistry and Biochemistry option. Unfortunately, this was the last intake and the course ceased to run. I joined the IST as an Ordinary Member and, in order to gain corporate status (and the post-nominal letters) I went to Paddington College on day-release for a year in order to gain the Part 3 and a Full Technological Certificate. This caused some administrative problems to the County Council as I was Cambridgeshire's first support staff member to study outside the county. I continued to study for some years after that and gained a first class honours degree in chemistry and technology with the Open University. This did not make me a better technician but it did give me credibility when dealing with people who did not understand the worth of technical qualifications. I was very grateful for the opportunities to obtain qualifications and, for many years, I was involved with hands-on training for lab technicians within the county and elsewhere – an aspect of my life that continues to this day.

IST Publications

From the beginning of the IST there has been a 'Journal'. In the early days there was also a monthly publication called the 'Bulletin' which gave details about the Branches and Groups and also included advertisements for jobs. The format of the Journal has changed several times but the content remains almost the same, with original papers demonstrating various skills and interest articles on history and work abroad etc There is no doubt that the present format of the 'Journal' is far superior to anything that has gone before.


IST BULLETIN

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Editor: R.M. ALLAN, AIST, 19 LEGGART TERRACE, ABERDEEN AB1 5UA telephone 0224-874154
Institute Office, 345 GRAY'S INN ROAD, LONDON, WC1X 8PX telephone 01-837 2207

EDITORIAL

CALLING THE MIDLANDS

INAUGURAL MEETING

Bulletin 1976

Journal today 2008

IST Branches and Groups

In the early years of the IST, technicians groups were more sociable. In a University or factory technicians recognised themselves as separate from the academics and office staff. Hence, from the outset, Branches were set up. These Branches had their own Committee and received some funding from the Council of the IST, but were encouraged to raise funds themselves by organising various activities. Branches were set up all over the country and named accordingly for example:-

Birmingham and West Midlands
Dundee
Glasgow
London
Newcastle
Sheffield
Solent
Sussex Downland
amongst others.

Branches would hold quizzes, social evenings such as wine tasting, visits to other laboratories, etc. London Branch used to organise big exhibitions such as the annual laboratory-ware exhibition called ISTEX (Institute of Science Technology Exhibition). Each year the Branches held their own Annual General Meetings and took it in turns to host the Annual General Meeting of the Institute.

By the 1970s technicians were becoming more specialised and there was a need to create dedicated subject Groups. The Histology Group, for example ran a number of symposiums in London where the lectures and exhibitors focused solely on histology. The Geology Group met mainly in the West Country, later it considered leaving the IST and setting up an autonomous organisation. By the 1990s, as the numbers of technicians in universities decreased, the bonding of technicians diminished, resulting in Branches and some of the Groups disbanding. The last active Branch was Sussex Downland. London and Dundee Branches still exist in name but have very few members and rarely hold a meeting. There is still a special interest group for Technicians in Education but this is awaiting new blood to take it forward.

IST Overseas

Abroad, membership has varied according to the country. For the past 17 years Derek Sayers as the Overseas Officer for the IST has been trying hard to produce a more international organisation for science and technology. Members from abroad are encouraged to form units within their own country. Ideally they would be separate but affiliated to the IST in the UK. However is some cases they would act in just the same way as a Branch. Further it is important that the IST (UK) qualifications are internationally recognised. The aim is to have a 'Commonwealth' of affiliated Institutes throughout the World, all on an equal basis. The qualifications of each would be recognised by the other Institutes so that people could move easily from one country to another. At the moment many countries have no formal technician/technology training and are suspicious of qualifications from other countries. It is still early days but the situation is improving.

Ghana

Ghana now has its own Institute of Science Technology which is affiliated to the IST in the UK. In 2002 Derek Sayers as the overseas officer of the IST visited Ghana and attended the inauguration of their Institute.

The Ghanaian Institute is completely autonomous from the IST in the UK however there is a very close liaison between the two countries and we try to attend each others meetings and committees.

The standard of teaching and research in Ghana is impressive as are the manual skills of the technicians. Their qualifications are allied to those in the UK. Unfortunately like many African countries funding is poor.

Nigeria
Our contact with Nigeria is growing. Initially the IST had a Branch in Nigeria which has grown into the Nigerian Institute of Laboratory Technology. It will be interesting in the future perhaps to have a closer association with Nigeria and discuss the various qualifications on both sides.

The Gambia
There are a few IST members in The Gambia and they wish to train lecturers to teach technology. Both the UK and Ghana have expressed an interest in helping them.

Botswana
A few years ago the members in Gaborone in Botswana were keen on establishing close links with the UK but as so often happens there is just one person who is the main contact and if he or she loses interest then it is difficult to progress in that country.

Malta
There has been a growing interest in Malta and we are trying to set up a centre for teaching technology for the Mediterranean nations. Derek Sayers has lectured there many times on the IST and qualifications. We are trying to set up a Maltese Branch, but as Malta is very small it is difficult.

Libya
This much maligned country has a strong interest in setting up a national training centre for technology. As so often with these emerging counties the use of technicians in places such as Universities is similar to that of the UK in the 1950s. There are many technicians who although very skilled, have had no formal training and lack the background knowledge in science or technology.

Belgium
Through a technician organisation there we are trying to set up a greater liaison with Belgium. However our aim is to have closer links with all the European Union countries.

Australia
Two of the IST Executive (UK) have visited technicians in Australia, but have not to date managed to set up anything. The problem is that there is no national technician training; in fact the various States do not recognise each other's qualifications.

Saudi Arabia
We have a number of IST Fellows in Saudi Arabia and we are trying to set up a Saudi Arabian Institute there.

The Future for IST

The addition of the word 'and' to the IST name in 2007 acknowledges the diversity of modern day technology and opens up the 'collecting net' for new members. No longer is the IST constrained to just science technology, it can now encompass other forms of technology. The words 'science and technology' are used throughout the world to express the way forward in a particular country's development. The IST aims to be a lead body in this development.

(We are indebted to the late Mr F.C. Padley, MBE for some of the early background story)

Terminology

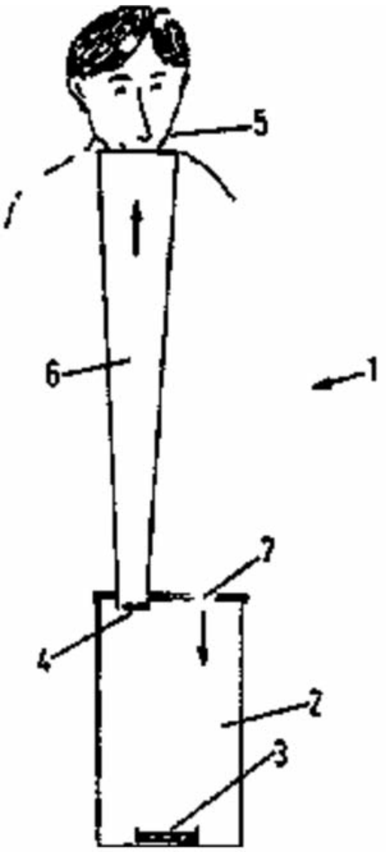
AScW	Association of Science Workers
STA	Science Technicians Association
NVQ	National Vocational Qualification
CGLI	City and Guilds London Institute
TEC/BTEC	Technician Education Council/Business and Technology Education Council
PAA\VQSET	an awarding body for specialist technical NVQs and Vocational Qualifications
CPD	Continuing Professional Development
CVQ	Core Vocational Qualification
PVQ	Preliminary Vocational Qualification
ISTEX	Institute of Science Technology Exhibition

TINNIES, TWIPS AND TWADDELL

Alan Gall, IST Archivist

If you are slightly less than six feet tall, take a bath five times a week and change your underwear daily, then you might very well qualify as a 'standard person'. Your odour strength will measure one **olf** and result in a perceived odour intensity of one **decipol** when generated in a space that is ventilated at a rate of ten litres per second with clean air. Anyone doubting that the **olf** and **decipol** are genuine units can easily verify, via the Internet, that the now deceased Danish environmental scientist Ole Fanger introduced these for the measurement of air pollution. The word olf is said to derive from olfactory and it may only be a coincidence that the 'ol' and 'f' also appear in Professor Fanger's name. Such units are a reflection of the desire by scientists and technologists to quantify their work whenever possible. As Lord Kelvin once said, although not exactly in these words: if you can't measure what you're talking about then you're doing some pretty poor science.

Units have many guises. There are those in the SI system that are expressed as, or derived from, a minimum number of base units. Others have been devised as a matter of practical convenience and can sometimes be related to the fundamental base units and sometimes not. The subject is vast of course, so I will merely pick out a few that I hope will have some entertainment value.



Povl Ole Fanger's 'Method for evaluation of air pollution and an apparatus for implementation of the method'
(Patent WO9102972, published 1991)

The reciprocal **ohm**[1], called the **mho**, has only recently gone out of fashion (well, recently as far as I'm concerned) but once-upon-a-time the **yrneh** was seriously proposed for the unit of magnetic reluctance. Difficulty with pronunciation probably put paid to its adoption, except by the Mongolian Physical Society perhaps. Astute readers will notice that **yrneh** is **henry**[2], the unit of inductance, spelt backwards. It is also, apparently, a first name in some countries. There is also the reciprocal **farad**[3], called the **daraf**, as a measure of electrical elastance.

My favourite is the **twaddell**[4]. Along with **brix**[5] and **baumé**[6], this is a measure of density used for liquids denser than water; useful for chemical plant operatives since 27 degrees **twaddell**, for instance, is much more memorable than the equivalent specific gravity of 1.135. Interestingly, the strangely named barkometer is not an instrument for measuring canine noise levels but another device for density determination, introduced for the tanning industry.

Tradition has it that we honour exceptional individuals by giving them a unit of their own. The **gauss**, for example, recalls one of the top mathematicians of all time, Karl Friedrich Gauss (1777-1855). Would he be upset to know that under the SI system his unit of flux density has been rescaled and replaced by the **tesla**[7]? There's nothing unusual in renaming: the unit of magnetic flux was once given in **lines** then as the **maxwell**[8], and is now expressed in terms of the **weber**[9]. Similarly, the **becquerel**[10] as a measure of radioactive decay (1 disintegration per second) has replaced the **curie**[11] (3.7 x 1010 disintegrations per second) and the **rutherford**[12] (one million disintegrations per second).
The **galileo**[13] (1 centimeter per second squared) is still used in the science of gravimetry for measuring the acceleration due to gravity.

Note that by convention, the person's name is not capitalised when used as a unit (eg 10 **tesla**) but the abbreviation is (10 T).

Computer programmers using Microsoft's Visual Basic (up to version 6) will have come across the **twip**. This unit of distance represents a twentieth of an Imperial Point and there are 1440 **twips** per inch. Related to this is **twips per pixel**, which depends on the resolution of the computer screen. Mercifully, Visual Basic recognises a simple line of code to change from **twips** to millimetres or inches.

Everyone will be familiar with the **Richter scale**[14] for earthquake intensity but how about the **Ringelmann scale**[15] for darkness of smoke or the **Linke scale**[16] for the sky's shades of blue? In 1967 doctors Holmes and Rahe[17] published what is now known as the **Holmes and Rahe stress scale**. From receiving a parking ticket (11 on the scale) to the death of a spouse (a value of 100), various life events have been rated in an attempt to correlate them with illness. A vacation ranks higher up the scale than a minor violation of the law, whilst the death of a close friend is only a little worse than 'a change in the number of arguments with a spouse'. However, not all stress is bad. A total lack of it can lead to boredom!

I am grateful to Bob Estreich for proposing the Australian unit called the **'tinnie'**. This refers to a tin can of beer and is a measure of outback travelling distance by virtue of an Aussie's average consumption rate of 'amber nectar' per mile. A short trip might be a two-tinnie journey and a long haul perhaps six or eight. However, the tinnie is a very imprecise unit since it depends on several factors such as road conditions, the ambient temperature and the time spent stopping to answer calls of nature. A word of warning: the **tinnie** is also non-linear with respect to rate of progress. After an optimum value of consumption is reached, further imbibing can lead to premature termination of the journey.

Footnotes

1 Georg Simon Ohm, German physicist (1789-1854) NB. Ohm's birth is given variously as 1787 and 1789 in the literature.
2 Joseph Henry, American physicist (1797-1878)
3 Michael Faraday, English experimental scientist (1791-1867)
4 William Twaddell, Glaswegian hydrometer maker (1792-1839)
5 Adolf Ferdinand Wenceslaus Brix, German mathematician (1798-1870)
6 Antoine Baumé, French chemist (1728-1804)
7 Nikola Tesla, Croatian-born American electrical engineer (1856-1943)
8 James Clerk Maxwell, Scottish physicist (1831-1879)
9 Wilhelm Eduard Weber, German physicist (1804-1891)
10 Antoine Henri Becquerel, French physicist (1852-1908)
11 Marie Curie, Polish-born French chemist (1867-1934) and husband Pierre Curie (1859-1906)
12 Ernest Rutherford, New Zealand-born physicist (1871-1937)
13 Galileo Galilei, Italian astronomer and physicist (1564-1642)
14 Charles Francis Richter, American seismologist (1900-1985)
15 Maximilian Ringlemann, French agricultural engineer (1861-1931)
16 Karl Wilhelm Franz Linke, German geophysicist (1878-1944)
17 Thomas H.Holmes & Richard H.Rahe, American psychiatrists

The Roscoe Brunner Affair

A review of 'Formula for Murder, The ICI Mystery' by R.M.Bevan

Alan Gall

When the giant soap-maker Lever Brothers[1] entered into a new contract with their suppliers of alkali in 1919, no one could possibly have guessed that it would lead to murder. Some degree of trouble may well have been anticipated by a few of those involved but certainly not what actually happened: a million-pound payment for breach of contract, followed by the deaths of Roscoe & Ethel Brunner.

Roscoe Brunner. Died on 3rd November 1926 from a single bullet to the temple

The large-scale manufacture of soap requires considerable quantities of the alkaline materials sodium carbonate and sodium hydroxide. Lever Brothers, as the largest soap producer in the country, depended on reliable supplies from a correspondingly large manufacturer - in this case Brunner, Mond & Company at Winnington, Cheshire[2]. After World War One, Levers' existing contract with Brunner, Mond ran out.

The new prices quoted were nearly 90% more than those agreed in 1913 due to increased production costs over the period. However, Levers were prepared to foot the bill provided that no other soap producer of any significance received better terms. It was simply a matter of imposing the higher prices on the other customers. Unfortunately for Brunner, Mond & Co an organisation that steadfastly refused to pay the new tariff was also a large soap-maker, the Co-operative Wholesale Society[3].

Written into the agreement was that Lever Brothers would accept the auditor's report on Brunner, Mond's sales as proof that the correct charges had been applied. But despite assurances given to Levers, the Co-operative people turned out to be totally uncooperative when it came to price hikes. Yet the business was too good for Brunner, Mond to lose. Their solution, one that avoided the problem of auditor's reports (which couldn't be fiddled), was to charge the CWS for alkali at full rate but hand back the difference by means of credits on other products. They might have succeeded with the subterfuge if Roscoe Brunner hadn't confessed to the manipulations in a letter to William Hesketh Lever[4]. Threats of legal action followed that ended with an out-of-court settlement for £1,000,000 in favour of Lever Brothers.

Roscoe Brunner held the position of chairman at the time. He was the son of the business's co-founder, John Brunner, and owed his first name to Henry Roscoe[5], a professor of chemistry at Owens College, Manchester. Roscoe was forced to step down as chairman over the affair, with the company plastering over the cracks by referring to his resignation as 'due to ill-health'. Meanwhile, moves were afoot to combine the interests of the leading UK chemical companies into a powerful group that could take on the likes of the German chemical industry. This amalgamation officially came into being in 1926 with the merger of Brunner, Mond & Co Ltd, Nobel Industries, the United Alkali Co Ltd and British Dyestuffs Corporation Ltd. Imperial Chemical Industries was born, with Sir Alfred Mond as chairman.

Ethel, the wife of Roscoe Brunner, felt that her husband merited inclusion on the board of the freshly formed ICI and she was not afraid to say so by visiting as many newspaper offices as she could for support. It all turned horribly wrong. Far from being grateful for his wife's efforts, Roscoe put a bullet in her head and then turned the gun on himself.

Ethel Brunner. Shot through the neck on 3rd November 1926

On the face of it, this was the tragic act of a man who, suffering from the shame of his fall from grace and harassment from an overbearing wife, suddenly cracked. But was there more to the whole affair than the superficial facts indicated? Certainly, the police investigation and inquest failed to explore many puzzling features of the case. Was it all a cover-up orchestrated by vested interests?

Journalist Mark Bevan thinks so and presents his case in 'Formula for Murder - The ICI Mystery'. This is a well-written account of the strange events lurking just beneath the surface of the public's perception of the case. Evidence is re-examined in the light of the hidden agenda of someone with powerful industrial muscle. This book is recommended for anyone with an interest in the formation of ICI, with the added spice of dark deeds thrown in. 'Formula for Murder' is priced at £9 from the publishers, CC Publishing. (First published in 2003, reprinted in 2006)

For further details see **www.cc-publishing.co.uk**

1 To become Unilever in 1929

2 Founded by John Tomlinson Brunner (1842-1919) and Ludwig Mond (1839-1909) as a private partnership in 1873.

3 By the start of the Great War, the CWS had established a soap factory at Irlam, next to the Manchester Ship Canal, one in London and the 'Dunston Soap Works' in the Newcastle area.

4 Chairman of Lever Brothers Ltd 1894 to 1925.

5 Henry Enfield Roscoe (1833-1915) first person to isolate the metal vanadium.

China in space

Ian Moulson

Will the new space race drive and advance the world's technology through another step change in the next 10 years?

On October 4th, 1957 the Soviet Union successfully launched Sputnik I, the world's first artificial satellite and kick-started the space race. In October this year NASA celebrated its first 50 years. It began operations on October 1st in 1958.

During the subsequent period leading up to the dissolution of the USSR the competition between the two nations helped to push huge resources into science and technology, which ultimately resulted in significant advances and spin-offs for us all. Predictions at the time had envisaged similar continued rates of development to give us manned stations on the Moon and Mars through to robots and free energy before year 2000. However, the financial cost of the race was huge and when the wall came down and the political chest beating and military one-up-man-ship dissolved so did the funding.

Chinese artist concept of a Shenzhou in orbit above Earth

A new race is underway. China is determined to become the leading world power and, as history shows us, emerging empires see new knowledge and technology as the key tools in achieving it. The US is now having to play catch-up in the space race while Russia seems prepared to hang on to China's coat tails as it steams ahead with an impressive, and to date an on-target, space programme.

The Peoples Republic of China, the world's most populous nation, sent three men to space in one ship on September 25, 2008. Two of the astronauts, known as taikonauts or yuhangyuans, left the Shenzhou 7 capsule briefly on September 27 for China's first-ever spacewalk. China's human transport spacecraft are called Shenzhou, which means Divine Vessel in Chinese. Transport capsules identified as Shenzhou 8, Shenzhou 9 and Shenzhou 10 are under development for launch in 2009-2010. The Asian nation plans to launch the three Shenzhou capsules to form a space station.

Shenzhou 8 and 9 will ferry equipment for a space station to be erected in Earth orbit, according to Chinese newspaper reports in 2005. It will be China's first space station and compose of the Shenzhou 8 and 9 capsules being finally joined together in orbit.

Shenzhou 10, will ferry people up to live and work in the space station where it would remain docked. All three spacecraft – Shenzhou 8, 9 and 10 – would be launched within the same month.

Later, China plans to send astronauts to land on the Moon in 2017, which will be three years ahead of NASA's planned landing of astronauts on the Moon in 2020.

Long Range Plan

The one-man flight in 2003 and the two-person flight in 2005 were early landmarks in China's long-range plan. China then launched in 2007 an unmanned two-ton satellite called Chang'e to orbit the Moon for a year and record 3D images of the lunar surface. In 2008, the two Chinese astronauts performed spacewalks during the Shenzhou 7 three-person flight while a small 88-lb. satellite was released to circle independently around the orbiter and send back images to mission control on the ground in China.

The small satellite was equipped with two cameras that could capture images at distances of four meters to two kilometers (km) from Shenzhou 7.

The satellite observed and assisted the main capsule with communication, scientific experimentation, and Earth and astronomy observation.

It provided Chinese ground controllers a chance to observe and control two objects in relative motion in space in preparation for orbiter dockings in future flights. China will need orbiter docking techniques for its next manned spaceship Shenzhou-8, which will be a step toward the building of a permanent space laboratory.

The Shenzhou 7 capsule itself returned to land on the Inner Mongolian steppe on September 28.

Next, China wants to:

- in 2009-2010, build a space station in orbit.
- in 2010-2011, land an unmanned probe on the Moon.
- by 2013, launch a rocket with triple the lifting power of the nation's largest. It would be able to carry a payload of 27 tons to space, three times today's nine tons.
- in 2015-2016, land another unmanned probe on the Moon to collect soil samples and return them to Earth in preparation for a human moon base.
- in 2017, land a man on the Moon.

It is reported that Chinese astronauts on the Moon in 2017 could set up an astronomical telescope and measure the abundance of helium-3, which could be used back on Earth as a non-polluting fuel source.

But let's have no illusions. The race is driven in the greater part by a military need; I suspect that the programme fits snugly with their military defence strategy, then perhaps a resource need and finally a science need. However, all these needs are intertwined and just as it was between the 60s to 80s the technological and science spin-offs could be potentially "life changing".

We may be on the edge of a new and exciting period that might just dwarf the first space race.

Acknowledgements
Spacetoday.org
NASA History Division

WORK TO START ON NEW LABORATORY OF MOLECULAR BIOLOGY IN CAMBRIDGE

The Medical Research Council (MRC) issued a press release[1] on 24th June announcing that they had received £67 million from the Government's Large Facilities Capital Fund towards the expected £197 million redevelopment costs of the Laboratory of Molecular Biology (LMB) in Cambridge. The MRC will provide the rest of the funds, which will be provided in part from capital generated from commercialisation of LMB discoveries and from leasing research space to the University of Cambridge. Planning permission has already been obtained and construction work on the new laboratory, which is expected to take three years, should start later in 2008.

The LMB started as an MRC unit in Cambridge in 1947 and moved to its present building in 1962. Over the years the work of the LMB has resulted in an impressive array of Nobel Prizes.

The press release quotes the MRC Chief Executive Sir Leszek Borysiewicz, 'The Laboratory of Molecular Biology has an outstanding track record as an innovator in medical research. The new building will allow the MRC to build on the LMB's position as a globally competitive research centre and continue to attract the best researchers.'

Further information is available from the MRC Press Office (or follow the link below)

Phone: 020 7670 6139

press.office@headoffice.mrc.ac.uk

[1] www.mrc.ac.uk/NewsViewsAndEvents/News/MRC004649 (accessed on 16th October 2008)

Space Virus

Article reported by Damien Francis, The Guardian Thursday August 28 2008

As far as space monsters go it is less menacing than Daleks or Klingons, but an unwanted intruder has made its way aboard the international space station. Gammima.AG, a malicious password-swiping computer virus, has broken new frontiers, by infecting two laptops on the ISS orbiting 215 miles above Earth. The virus was first detected on Earth in August 2007 infecting machines to steal login names for popular online games.

NASA officials have begun an investigation into how the virus made it aboard the ISS, but it is thought it might have been inadvertently carried into space on an astronaut's USB drive. Reports suggested that once on board the station, the memory device was plugged into the computers, infecting them both. Computers on the ISS are not directly connected to the internet but they have access to a satellite data link. They are not part of the space station's 'command and control' network, NASA said. It is understood astronauts were using the laptops to compose email and store information on nutritional experiments.

Once it has scooped up passwords and login names Gammima.AG tries to send them back to a central server. It targets a total of 10 online games most of which are popular in the Far East. NASA, who described the virus as a 'nuisance' is now working with its international partners on the space station, including Russians, to find out how it got on board. NASA spokesman Kelly Humphries said: 'It's not a frequent occurrence, but this isn't the first time.'

The ISS is a joint project between NASA, the European Space Agency, and the space agencies of Canada, Russia and Japan. It has been continuously manned by astronauts since 2000.

Acknowledgements
The Guardian

The Science of Speed

How world class UK research is behind the fastest car in the world

World class UK research is helping to build the fastest car in the world thanks to the Engineering and Physical Sciences Research Council (EPSRC).

The BLOODHOUND SSC Project, led by Richard Noble OBE, is aiming to set a new world land speed record of a thousand miles per hour by 2011.

The challenge at the heart of the project is to create a car capable of 1,000mph - a car 30% faster than any car that has gone before.

An aerodynamics team at Swansea University - funded by EPSRC - is playing a vital role. Using Computational Fluid Dynamics (CFD), the team has spent the last year creating the predictive airflow data that has shaped the car.

In time, the research could lead to better vehicle or aircraft design, improved fuel efficiencies, and even new medical techniques.

“From the nose to the tail, anything that has any kind of aerodynamic influence we are modelling,” says researcher Dr. Ben Evans - who as a school boy watched the Thrust SSC record on TV.

“It's the kind of thing aerospace engineers would have traditionally done in a wind tunnel, but we're doing it on a computer, a big multi-processor super computer. Wind tunnels have massive limitations. BLOODHOUND SSC is a car, so it's rolling on the ground and there are no wind tunnels in existence where you can simulate a rolling ground with a car travelling faster than mach one, faster than the speed of sound.”

This 'mach factor' is the major difference between this vehicle and its predecessor Thrust SSC. Thrust SSC was a supersonic car in that it crossed the sound barrier and was supersonic for a matter of seconds.

But with BLOODHOUND, the target speed is 1,000mph - mach 1.4. It will be going supersonic way beyond mach one, and for a much longer time period, which means the supersonic shockwaves it creates will be far stronger than Thrust SSC, and they will interact with the car and the desert floor for much longer.

“Once you start approaching, and go beyond the speed of sound, you can no longer send a pressure wave forward to tell the air ahead of you you’re coming,” explains Evans. “What happens is a big pressure wall builds up in front of you. Rather than air slowly and smoothly getting out of the way, at supersonic speeds these changes happen very suddenly in a shockwave.”

Supersonic aircraft create these shockwaves and they dissipate in the surrounding atmosphere but still reach the ground as a ‘sonic boom’.

Evans adds: “What we're trying to understand is what happens when this shockwave interacts with a solid surface which is a matter of centimetres away.”

What the team do know is this ‘interaction’ creates a phenomenon known as 'spray drag’ - a term first coined by BLOODHOUND team member and aerodynamicist Ron Ayers during the Thrust SSC attempts.

Spray drag is an additional drag component not accounted for in aerodynamic or rolling resistance theory.

“As the car interacts with the desert, and the shockwaves interact with the desert, they actually eat up the desert floor,” says Evans.

"That introduces sand particles into the aerodynamic flow around the car and this interaction is not accounted for in standard CFD work. We plan to look at this spray drag phenomena, what happens and when, and how the sand particles impinge on the car."

The Swansea team are also looking at key systems in isolation. Work has already changed the car from twin to single air intake for stability.

The car will also sport solid titanium wheels with twin ‘keels’: “That was fundamentally an aerodynamic design decision,” says Evans. “We studied different design options, a single keel running down the centre of the wheel, a design that had three keels and finally the one we went for with two keels. It was chosen as a compromise between lift and drag patterns and minimising the pressure disturbance around the wheel on the desert surface.

“Another thing we have been looking at closely is the exact nose shape. We want a nose that constantly generates a small down force on the front to help keep the car on the ground. But we're also constantly looking a how we can minimise spray drag and if we can constantly achieve a positive pressure on the desert surface leading up to the front wheels then hopefully the surface will remain intact until the front wheels roll over it.”

But Evans and the team also remain focussed on the wider aims of the project and the application of their research in other areas.

“The whole point of doing this is not just to create a fast car. We live in a carbon economy and lots of the issues we face will require engineers and scientists to solve them - part of this project is to inspire young people.”

And sat at his desk in Swansea he has a constant reminder of the potential of CFD.

"Some of my university colleagues are working on blood flow monitoring through the arterial system and trying to predict when aneurysms will explode through pressure loadings.

“On one side of the office we have pictures of Bloodhound and on the other we have pictures of blood flow through the heart.

“There are the obvious applications in aerospace, but any application you can think of that involves fluid flow can be modelled using CFD. Biomechanical systems seems to be one of the areas CFD is being applied to now.”

Engineering and Physical Sciences Research Council press release

For more information or interviews contact:

EPSRC Press Office on (01793) 444404 or e-mail: lawrie.jones@epsrc.ac.uk

More information is available on the Bloodhound SSC project website and the EPSRC Bloodhound SSC webpages.

Laser driven fusion to develop the path to carbon-free energy on a global scale

European High Power Laser Energy Research Facility (HiPER) preparatory phase launched

"This is a really exciting time for fusion. The European community has defined a strategic way forward, centred on this new project."

Professor Mike Dunne

The quest for abundant safe clean energy is one of the most important challenges facing mankind, and HiPER (High Power laser for Energy Research), a European research project led by the UK, will harness nature's prime energy source – Fusion – to demonstrate a credible path to laser driven fusion as a commercial energy production source and offer a broad based science research facility.

A European collaboration of leading physicists and government officials representing 10 countries, and supported by science partners from fusion research establishments worldwide, formally signed an agreement today (6 October 2008) to coordinate a three-year preparatory phase to establish the planning and design for the full HiPER facility.

Professor Mike Dunne, HiPER project leader and Director of Photon Science at the Science and Technology Facilities Council (STFC) commented "This is a really exciting time for fusion. The European community has defined a strategic way forward, centred on this new project. 26 institutions from across 10 nations are working together to meet this challenge – combining the science of the extreme with one of the most compelling issues facing our society. Fusion is not a short term fix, but is designed to meet the long terms needs of our civilisation".

Professor Dunne added, "The benefits of fusion energy cannot be overstated in a global setting where climate change, pollution, energy security and the ever increasing demand for energy consumption represent the principal challenge facing humankind. HiPER represents a very significant step on that journey."

The 'proof of principle' of laser fusion is anticipated in the next few years based on two very large scale lasers currently nearing completion in California (NIF) and Bordeaux (Laser Megajoule). This marks the culmination of over 50 years of research. HiPER will take the 'proof of principle' forwards by establishing a credible route to future construction of a commercial laser fusion power plant as a future energy source.

"The benefits of fusion energy cannot be overstated in a global setting where climate change, pollution, energy security and the ever increasing demand for energy consumption represent the principal challenge facing humankind. HiPER represents a very significant step on that journey."

Professor Mike Dunne

The HiPER laser will also have a major impact on a wide range of fundamental science topics – enabling researchers to study here on Earth some of the most extreme conditions in the Universe. Reaching temperatures and pressures only otherwise found at the centre of the Sun, or in an exploding supernova.

Very significant advances have recently been made in fusion research and the use of extremely powerful lasers is one of the two approaches which aim to deliver solutions for carbon-free energy on the industrial scale in the medium term.

This phase of HiPER (part of the UK and European Roadmaps for future research facilities) will mobilise the large European laser community to ensure their work is fully coordinated to meet this grand scientific challenge.

A key aspect of this will be to use the PETAL laser facility under construction in Bordeaux. This is an intermediate scale laser which will be directly linked to the HiPER project to ensure the rate of progress is as fast as possible.

The future location of HiPER is being explored over the next few years, with the UK being a prime candidate.

Science and Technology Facilities Council Press release

Contact for further information

- Natalie Bealing

STFC Press Office

Tel: + 44 (0)1235 445484

Harnessing New Technology to keep Older People behind the Wheel for Longer

Extending the age at which people can drive safely - EPSRC at the BA Festival of Science

A new study has highlighted the key role technology could play in extending the age at which people can drive safely on our roads.

With input from older people, researchers from the University of the West of England, Bristol, have identified ideas for innovative in-car information systems which, if developed, could help compensate for the reduction in reaction time that affects many drivers as they get older.

The research could give older people the confidence to continue driving for as long as their capabilities allow. Crucially, because the systems would not take control of the car away from the driver, they would also enable users to retain their sense of independence.

Undertaken as part of the SPARC (Strategic Promotion of Ageing Research Capacity) initiative, the study was discussed at this year's BA Festival of Science in Liverpool on 11th September. SPARC is supported by the Engineering and Physical Sciences Research Council (EPSRC) and the Biotechnology and Biological Sciences Research Council (BBSRC).

Specific ideas generated include:

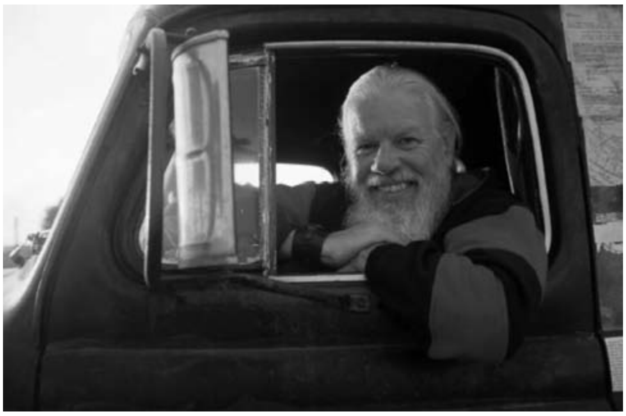
- A system that unobtrusively displays road sign information through a head-up display on the windscreen. This is a see-through display that shows information without impeding the user's view. Harnessing Global Positioning System (GPS) technology, this would track a car's position and identify approaching signs. Exactly the same information contained in the signs would then appear on the windscreen at the right moment. The driver would therefore not have to keep scouring the road side for information.
- A system providing the driver with audible feedback on their current speed, again harnessing GPS technology. For example, one short, non-distracting bleep could indicate the car is approaching the local speed limit; a longer bleep could indicate the speed limit has been reached. The driver would therefore not have to look at the dashboard so often.

The systems have the potential to minimise the amount of time drivers divert their attention from the road ahead, cutting the chance of an accident.

These ideas emerged as a direct result of a groundbreaking survey of older people's driving-related needs and attitudes undertaken as part of the study. This was the first-ever wholly qualitative* study to focus specifically on this topic. Over a six-month period, focus groups and interviews were conducted with a sample of 57 people aged between 65 and 85. The sample included a balance of men and women, those living in urban and rural areas, and people who were still driving as well as those who had given up.

A key finding was the important psychological role that driving plays in older people's lives, in contributing to feelings of independence and freedom, and their quality of life.

Those surveyed expressed strong reservations about in-car technologies now under development which aim to take an



element of control away from the driver (e.g. systems automatically limiting car speeds or regulating the distance between a car and the vehicle in front). By constraining feelings of independence, such technologies could discourage older people from driving even though they are still physically capable.

But a strong preference was expressed for technologies which simply improve information provision and aid decision-making, such as the GPS-based systems described above.

"Our research highlights issues that have been overlooked by car designers and those advising older people on lifestyles", says Dr Charles Musselwhite, who led the study. "The current emphasis on developing technologies which take over part of the driving task may actually end up deterring older drivers. By contrast, better in-car information systems could help them drive safely and ensure they want to keep driving."

Dr Musselwhite and his team are now planning to work with technical experts to produce a prototype speed information system and in-car road sign information display system.

The study also highlighted that:

- Older women are currently more likely than older men to give up driving voluntarily. This may be because driving tends to play a different role in older men's perception of status and role.
- Older drivers' needs can be split into three categories: practical (e.g. going to the shops or doctor's surgery), social (e.g. visiting friends and attending functions) and aesthetic (e.g. enjoying the countryside and fulfillment of independence and control over one's life).

* Qualitative research is designed to explore beliefs, attitudes and perceptions through focus group discussions, for example. By contrast, its counterpart, quantitative research, involves asking respondents to identify with one or more of a selection of pre-determined answers to structured questions.

EPSRC Press Office press release, contact: 01793 413084
or e-mail judy.moreton@epsrc.ac.uk

IST New Members/Upgrades Jun 2008 – Oct 2008

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Membership No	Members Name	Grade
T14571	Mr T. Oyewumi	MIScT
T14641	Mrs J Chapman	MIScT
T14642	Mr J Smedley	MIScT
T14643	Mr A A K Agboola	MIScT
T14644	Mr P R Keen	MIScT
T14645	Mrs K Coffrey	MIScT
T14646	Mrs L Baxter	MIScT
T14647	Mr F O Ashiedu	Assoc IScT
T14648	Mr C J Martin	MIScT
T14649	Mrs B O Atobatele	MIScT
T14650	Mrs O T Akinola	Assoc IScT
T14651	Mr P G Cubbin	MIScT
T14652	Mrs H Basford	MIScT
T14653	Mr O Oguntade	MIScT
T14654	Mr I C Omokhae	MIScT
15 IN TOTAL		

REINSTATEMENTS

Membership No	Members Name	Grade
T12259	Mr J E Cousins	FIScT
1 IN TOTAL		

UPGRADES

Membership No	Members Name	Grade
T14590	Keith Nixon	FIScT
T8850	Philippa Nobbs	FIScT
2 IN TOTAL		

CPD AWARDS

Membership No	Members Name	Grade
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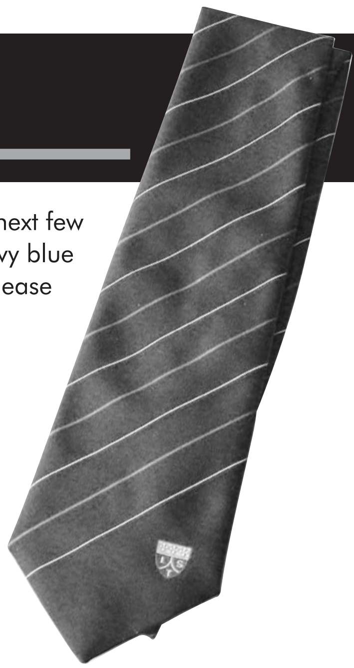

We do have plans to introduce additions to our corporate merchandise over the next few months but for now we just have ties available. These are smart and modern, navy blue and are of a high quality. At the moment there is a limited supply available, so please contact the IST office.

The prices are: -

New Style Blue Ties £10.00 + postage as below

- **UK Postage 38p. per item**
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Institute of Science & Technology
Kingfisher House
90 Rockingham Street
Sheffield
S1 4EB

Tel: **0114 276 3197**
during normal office hours

Email: **office@istonline.org.uk**
Web: **www.istonline.org.uk**

The Institute of Science & Technology

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Kingfisher House
90 Rockingham Street
Sheffield
S1 4EB

Tel: 0114 276 3197

office@istonline.org.uk

www.istonline.org.uk