The Worshipful Company of Engineers

(Incorporated by Royal Charter 2004)

The Swordsman Newsletter

Issue 33, November 2014

CONTENTS

FUTURE EVENTS

17th December 2014	Annual Carol Service and Dinner	Tower/Clothworkers Hall
13th January 2015	Court Meeting and Partners' Dinner	Tallow Chandlers' Hall
10th March 2015	Election Court and Dinner	St Vedast /Wax Chandlers' Hall
20th March 2015	United Guilds Service	St Paul's Cathedral (11 am)
	Post UGS Lunch	TBA
28th April 2015	Installation, Common Hall and Dinner	Stationers' Hall
29th April 2015	Brooch Luncheon	Wax Chandlers' Hall
13th May 2015	New Members' Evening	Wax Chandlers' Hall
12th May 2015	361st Festival of the Sons of the Clergy	St Paul's Cathedral (5 pm)
17th June 2015	Warden's Lecture and Lunch	TBA
24th June 2015	Election of Sheriffs	Guildhall (Liverymen)
	Post Election Lunch	TBA
14th July 2015	Awards Dinner	Drapers' Hall
17th July 2015	Penny's Informal Midlands Dinner	Hampton Manor
29th July 2015	Annual Golf Day and More!	Mentmore Golf Club
24/27th September 2015	Master's Out of Town Meeting	Bath and Bristol

I am most grateful to all who have contributed to Issue 33 of The Swordsman both for the reports and the photographs. In addition to those named for their article, there is a substantial group of willing talent on whom Gill and I will be calling now that they have shown how great they are!

One of them, John Canning has put all the photos he has taken over the last year on to his flickr website and he invites you all to view them using the following links:

Carol Service 2013	https://www.flickr.com/gp/johnc001/pt3L7r/
Installation Court Dinner 2014	https://www.flickr.com/gp/johnc001/9280XV/
Awards Dinner 2014	https://www.flickr.com/gp/johnc001/33109Y/
Hampton-in-Arden 2014	https://www.flickr.com/gp/johnc001/ZpyCbD/
National Lift Tower 2014	https://www.flickr.com/gp/johnc001/26i9HA/
Glasgow Thursday 2014	https://www.flickr.com/gp/johnc001/5229tn/
Glasgow Friday 2014	https://www.flickr.com/gp/johnc001/1oV3gd/
Glasgow Saturday 2014	https://www.flickr.com/gp/johnc001/pWh4E9/

Salve and Vale

It was about four years ago, after an excellent Livery Dinner (as they always are!), but more importantly after a moderate amount of accompanying wine, that Raymond – aided and abetted by Ruth – suggested to Gill and me that we should take over the production of The Swordsman; at that time it didn't sound too arduous a proposition and in any case, it was a long way away and I had the Wardens' roles to look forward to and my year as Master.

Well here we are, and here it is, the first of my line. And after: securing reporters for each of the events; and arranging for a copious supply of photographs to illuminate the articles; and preparing the copy (I think that's what it is called in the trade); I have experienced what I have really known all along - what a huge effort it is, and so much relying on the goodwill and support of so many fellow Liverymen and partners, including – not the least – Gillian.

I feel sufficiently informed now, therefore, to thank and commend Past Master Raymond Cousins for his brilliant Editorship of The Swordsman over the last 10 years.

You may recall that Raymond took charge after the death of David Mitchell, the *Emendator Primus* of The Swordsman, Issue 1 of which was published in October 2000. Company Newsletters had been published before that, thanks to the good offices of Gerry Clerehugh amongst others. These were continuously developed by David and then Raymond into the comprehensive catalogue of Company activities we have today.

In this Issue 33 I have intentionally duplicated Raymond's style of publication as a tribute to his generous gifts of time and talents over the 10 years of his Editorship, a period which will most certainly not be repeated by me!

It is planned to upgrade the Company website, which will provide the opportunity to post some of the current content (such as verbatim reports of speeches and lectures) to allow easy access for those who may not have been present at a particular event and who would like the full detail of what was said. However, I intend to continue to report these, but in summary, which will allow more opportunity to report on the more informal activities of our Livery and Liverymen.

I will be interested to learn your views on this; be warned though that I am already actively seeking my replacement as Editor!

I will do my part in maintaining our Swordsman as the informer of the life of our Livery: to the Livery, to our former livery colleagues, to other Liveries and interested parties; by the Livery for the Livery. Now where have I heard that before?

David Scahill
Emendator Tertius (ET?)

CLAY PIGEON SHOOT HOLLAND AND HOLLAND NORTHWOOD 21st May 2014

On 21st May the Master, John Baxter, led a team of guns in the annual inter livery clay pigeon competition organised by the Worshipful Company of Environmental Cleaners. The team representing the Engineers was John Baxter, Margaret Baxter, Dave Cooper and James Edge with Lynda Cooper as spare gun. The annual event is held in the splendid setting of the Holland & Holland shooting ground near Northwood, London. Over a hundred livery teams representing 78 livery companies entered demonstrating the serious nature of the competition in the event.

The stands were laid out with two matching courses and ten stands on each of which eight birds were offered up. The stands were arranged as an English Sporting layout to represent some of the more common birds seen in the UK. In addition a "flurry" stand of 80 birds was set up

where all guns go for anything in the air with rapid reloading by assistants!

This was the second time the Engineers had entered the event; we came through with our heads held even higher than last year. Margaret Baxter was the highest scoring lady in the event with 64 out of 80, with her closest rival being six shots behind her! An outstanding performance for which she received a silver cup which she retains for a year and will be engraved with her name, a glass trophy which she retains, and a cheque for the charity of her choice.

Our team was consistent with all guns having a hit rate above 50% and with an average of 62.25%. The event finished with a superb buffet lunch including two very large pig roasts!

If any liverymen are interested in joining the Engineers' team in future years please contact Dave Cooper – *dc@lecs.co.uk*.

Dave Cooper

KILIMANJARO
12th to 22nd June 2014

The Master Engineer and his Lady were part of a BP team that attempted to climb Kilimanjaro in Tanzania to raise money for the humanitarian skills charity RedR. John is an Hon Vice President of RedR and has linked BP as a patron of RedR.

Delighted to report that they completed the charity climb successfully and all returned safely. It was the toughest combined mental and physical activity they have ever experienced and tested all of the team to their limits and beyond. John lost 10+ lbs in 6 days! Margaret just said it was 'horrendous'!! But they did it despite encountering below zero temperatures and half the oxygen level of London when you head towards 19,341ft! The final climb starts at midnight and goes up a very steep volcanic rock and ash face slope about the height of Ben Nevis! It took around 7 hours to climb which seemed forever.

It was only as the sun started to rise and light up the glaciers and the rim of the volcano crater that the team knew they would make it. A number of the team dropped back due to altitude sickness, but in the end all got above 5000m and the majority made it to the summit. Margaret also dropped back and was ready to give up around 3.00 am. From somewhere she put in a Herculean effort and made it to the top but it took about another 5+ hours. The whole team was really proud of her grit and determination.

A large number of people have sponsored John and Margaret, plus the Engineers' and Tallow Chandlers' Charitable Trusts. The team of 13 climbers is heading for £100k raised for RedR.
The team did a day of humanitarian skills training with a RedR East Africa specialist before the climb. A great way to team build and also to learn what it is like to build and run a refugee camp for 10's of thousands of displaced and distressed people.

Donations given through the Engineer's Trust will be consolidated into one cheque and hopefully presented to HRH The Princess Royal, President of RedR.

(More photos are shown on the inside back cover)

The Master

THE WARDEN'S LECTURE WAX CHANDLERS' HALL 25th June 2014

Richard had subtitled his talk "A load of rubbish." Judging by the enthusiastic response and numerous questions, the content was, but the quality certainly was not.

He described the audience as learned and scary, which of course we were; if not experts in waste treatment, then certainly in recycling and rubbish collection from our homes. Richard took us on a journey starting with his work on Tabasco Sauce as a chemical engineer in the food industry, to his involvement with Europe's largest waste PFI scheme in Greater Manchester.

Senior Warden Air Vice-Marshal Patrick O'Reilly thanked Richard for his lecture and confirmed it had been excellent rubbish. He asked the audience for questions and a sea of hands went up. The following is a summary, grouped in themes, of the answers Richard gave.

Differences in local rubbish and recycling collection are caused by the differences in equipment the local authorities have. For example, high temperature in-vessel composters are required to deal with food waste collected with garden waste. The key for the industry going forward, will be the availability of capital investment allowing local authorities to invest in new plants that can deal with the various waste streams.

Aluminium is easily separated from the waste stream where it is sent to specialist units that can deal with other contained trace metals and deleterious elements. Batteries can only be recycled at specialist units and cause problems within other waste streams. The best approach is to separate them at source. Yoghurt pots can't be recycled, so they are shredded and used in such applications as walkways. Float glass is very different from bottle glass and hence only bottle glass can be recycled. There is not a green glass mountain anymore and all colours of bottle glass can be recycled. Local authorities can sell the by-products from modern processing plants due to their strict quality control e.g. ash for use in roads and compost for use in the gardens.

The use of water is significant in mechanical biological treatment plants although the bulk of it is re-used. Any that is not, is treated and the residue land-filled.

There do not tend to be undergraduate courses in waste treatment. Moreover, waste management tends to form an important model of other courses such as chemical engineering. The Greater Manchester PFI scheme involves a great deal of education with purpose built learning facilities. Education includes the public using the recycling sites as well as local schools. It was noted that well informed children help drive change in their parents' behaviour.

There was much debate on the pros and cons on burning waste to recover energy. Whilst recycling and re-using some waste items can be seen as beneficial in reducing our consumption of natural resources, it can reduce the calorific value of the waste and hence its energy producing potential. It is a complicated cost-benefit equation involving many factors. Greater Manchester currently burns 20 to 30% of its waste.

The ideal way to deal with agricultural waste would be initial anaerobic digestion followed by combustion of the remaining waste.

The methane produced by anaerobic digestion of organic matter is converted to electricity which is used by the processing plant. The plants are constructed from stainless steel to overcome corrosion issues associated with methane. A small amount of methane is stored on site as a buffer, but generally the methane is converted to electricity as it is produced.

In his vote of thanks for Richard's tour de force of the domestic waste industry, Patrick speculated on the average composition of our household waste (1 tonne per household per annum) and suggested some liverymen may have a lot more green bottles than others!

It must have been the first Junior Warden's lecture for a while at our home in the Wax Chandlers' Hall. Richard was very brave to organise his own PA system and PowerPoint with embedded videos, however everything worked perfectly. The lunch comprised pan roasted sea bass fillet with lobster butter sauce, new potatoes and green beans followed by steamed raspberry sponge and whisky anglaise sauce. Appropriately, the wine was recycled, the Clerk having had bottles left over from a previous livery dinner!

Jan Lewis

DEVELOPMENTS IN UK DOMESTIC WASTE PROCESSING BY RICHARD GROOME

Over the next 50 minutes or so I intend to cover a brief snapshot of my career, where we were in the UK re waste processing just a few years ago, why a "do nothing" scenario was not an option, the processes / techniques employed to improve the position using Manchester Waste as an example, and where we are now.

For those of you that don't know me very well a brief snapshot of my career. In the early part of my career as a young chemical engineer I was involved in the production of such diverse food products as Horlicks, Tabasco Sauce and Muller Yoghurt. With Express Dairy I pioneered the automatic machinery for cream and butter portions in the late 1970s. The fact that the portions have rounded corners in the base is down to my wife Janet who insisted that they be easy to get the butter out of.

Much of the dairy products today with no preservatives, low-fat, artificial sweeteners etc. are down to the development work in the 80s and 90s. I was also behind 80% of the base station buildings used by UK mobile telephone networks and later this business model was rolled out across Germany Switzerland and Austria. With Elliott group I researched and introduced the Heras type fencing that is now used for many building sites, and we were the first UK manufacturer of bathroom pods particularly for student accommodation. More recently I've been behind the largest programme of new health care centres in the UK and recently constructed 18 schools, 13 police stations, three hospitals, various facilities for the MoD, three city street lighting schemes, new social housing, waste processing facilities and currently working on mental health facilities development. Most of what I did recently was under the Private Finance initiative (PFI) and I had not intended to cover the politics of that initiative in this lecture but I do have a few explanatory slides at the end if you particularly want to ask questions on that.

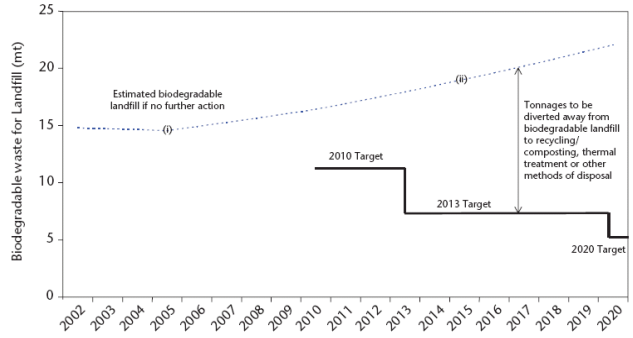
So now to developments in UK waste processing.

What I'm going to talk about is domestic waste and I will only make passing references to other waste streams. This story of domestic waste is an industry in the UK that has gone from nothing to high-tech in the last eight years and if you go back in history Steptoe and Son or their colleagues were responsible for most recycling in the UK.

Up to 2005 UK waste disposal was largely based on landfill, with an industry dominated by a large number of local players working off a low capital base. The low cost of landfill meant there was no need for investment in technology.

UK household waste was rising 3% per year at this point and was projected to double by 2020 and by then it would add £1.6 billion per annum to waste disposal costs. But the tipping point came

with a series of directives and new regulations including waste framework, landfill, packaging waste, environmental permitting, hazardous waste directives and the WEEE regulations. At the same time local councils recognised that they (shock horror) had limited landfill capacity and the landfill directive alone would make the ongoing cost of continuing to fill the ground double again by 2020.



Here is a graph showing the biodegradable part of the landfill in England against the EU landfill directive targets and you can see that if no further action had been taken the biodegradable landfill would have reached 20 Mt by 2020 whereas the landfill directive requirement was to be below half of that.

So the government at the time commissioned the Kelly report 2006 and the main conclusions of the report were:

1. that although there were now some major players in the market it was unbalanced and some operators had assets and some did not.
2. there was a lack of development skill in both contractors and local authorities and a lack of market intelligence.
3. the need for rapid investment was urgent, doing nothing was not an option and poorly performing authorities could even have their responsibilities removed or be forced to merge with other authorities.

Additionally it was recognised that there were also powerful climate change reasons for effecting change. Landfill was producing large quantities of methane which would trap 86 times more heat in the atmosphere than carbon dioxide over the next 20 years. Huge reductions in rail and road transport should also be possible. At Manchester alone this represented seven full freight trains per day going across to Yorkshire landfill sites. And so a series of projects was born. It would be 2009 before anything much else happened, mainly because of the finance required.

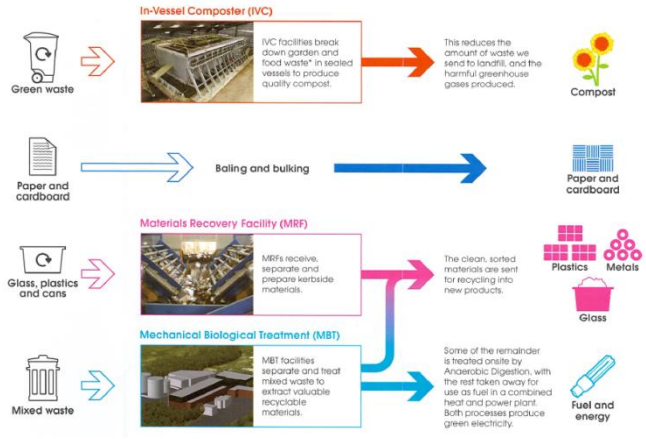
In 2006 - 7 the composition of municipal waste included 18% food waste, 16% garden organic waste, 10% plastics and 6% glass.

The municipal waste management in the EU in 2007 was such that poor little Malta had 92% landfill with recycling at about 8%. Best in class was Germany where landfill was virtually nothing, recycling almost 70%, with the rest being incinerated. The EU average was around 40% landfill compared with the UK with 60% landfill and about 8% going to incineration.

The constituents of household residual waste are shown below, but remember things change with time.

On the left are recyclable waste; steel and aluminium cans, domestic plastic bottles of two particular types, paper and cardboard and glass bottles and jars. On right non-recyclable; waste plastic bags and sacks, margarine and yoghurt pots, broken crockery, polystyrene and glass from things like windows. Food waste is now readily recycled but not by all authorities.

What can be done with this waste depends on many factors including the mix of waste which can vary even within close geographic areas, calorific value (more about that later) and other factors, but broadly the processes available are: sorting and recycling: most metals are 100% recyclable and food containers can be back on the supermarket shelf within six weeks; biological recovery for gas and electricity production; composting with or without food waste; thermal recovery with landfill as a last resort.



There are four solution routes for various streams shown on the left. Green waste can be put through in-vessel composting and more about that later, the particular one shown here processes food waste as well as garden waste. Paper and cardboard particularly in Manchester tend to be collected bailed, bulked and sent up to specialist re-processors. Glass, plastics and cans are put through a materials recovery facility - more about that also in a moment. Mixed waste which some would recognise as black bag waste tends to be put through the MBT plant (mechanical biological treatment) which combines recycling with the production of biological 'soup' suitable for anaerobic digestion.

Manchester Waste was the largest project in Europe. It covers the area of Greater Manchester but excluding Wigan which for some reason stayed out of the project. It processes 1.2 million tonnes of waste per annum, which is 5% of the UK waste, servicing 1 million households. The target was to divert 75% of all waste from landfill and be zero landfill within 10 years as is the case in Birmingham. 43 new plant and facilities have been installed in Greater Manchester and there is a new thermal recovery facility in Runcorn. The investment was £650 million and was financed through PFI. It has created 5000 new jobs.

Why and how Greater Manchester choose this route? Firstly what facilities they had were in many cases inadequate, non-existent or aged. Secondly the risk for local authorities was that if they didn't have a range of processes then they would be forced to use out of area equipment or face punitive landfill charges.

So a complex waste flow and finance was commissioned, measuring cost benefit for each of the proposed elements of the project. A 'do it ourselves' option was costed, to include all ongoing maintenance and lifecycle which are normally included in alternative PFI deals. The option offering best value for money was to retain the collection services, enter a partially funded partnership with the private sector to build the new plant and pass all operating risk to the private sector.

Commercial banks provided 31% of the total, European investment bank 23%. The sponsors of the project in this case John Laing and Viridor provided 19% of the funding which is high for a PFI deal. Also unusually, the Treasury infrastructure funding unit provided 15%, the one and only investment this department has ever made. Finally there was a capital contribution and a senior debt contribution from the original waste authorities.

Arkwright Street HWRC

This is a picture of one of the household waste recycling sites and I'm sure many of you have visited similar facilities. This one is particularly well-designed with clear delineation between pedestrian walkways, vehicle parking and through routes.

Now I would like to give you more technical information about the various plant items in the Manchester-based project that I referred to earlier.


The first is mechanical biological treatment plants (MBT). There are five of these in the Manchester project with a capacity for 500,000 t per annum. The black bag waste entering plant will first have metals and glass removed and then treated to produce two output streams, one, an organic rich 'soup' suitable for anaerobic digestion, the production of methane, and thence to electricity via on-site generation. The second is a solid recovered fuel which is a compressed waste suitable for burning at Runcorn heat recovery plant where steam and electricity will be produced. These plants produce 10 MWH of renewable power and 275,000 t per year of high calorific value SRF. The amount of residue going to landfill is very small and is confined to grits etc. destined for road construction.

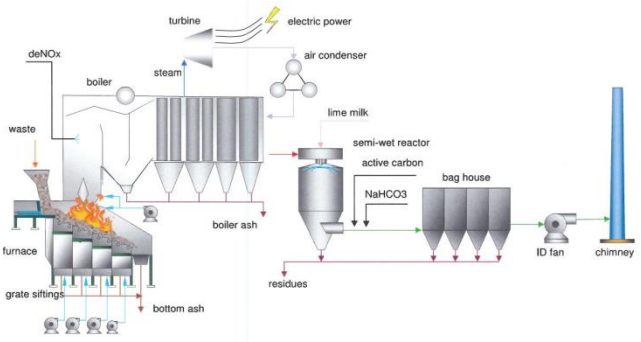
The second process is the materials recovery facility otherwise called the MRF.


In Manchester these can process 90,000 t per annum and use various processes to sort glass plastic bottles and cans.

Next further details of in-vessel composting. This part of the process handles 170,000 tpa and treats kitchen and food waste. It does that by composting at a higher temperature so that it can be Animal by-products compliant and kill all pathogens. The building features full odour and environment controls to avoid any noxious odours escaping the structure.

The final part of the Manchester waste project is a thermal recovery plant (a modern engineered incinerator) based in the middle of the old ICI plastics plant at Runcorn.

It will convert solid recovered fuel into 100 MW and 140 t of steam per hour for use on the site.



A process schematic of the energy from waste plant.

You can clearly see how the design is intended to have very little emissions coming from the chimneys.

We are still incinerating only 12% of UK waste although this is increasing, compared with 40% in Germany. EFW plants have no emissions like dioxin and no production of methane. The carbon monoxide and the particulates emitted are less than a main road passing by. They reduce the waste volume to less than 5% thereby leading to landfill reduction. They don't have to look ugly as the picture shows, this plant is in Austria. But everything depends on calorific

value; for instance I have been round EFW plants in Switzerland where everything is incinerated that is not taken to the recycling centre by the residents. The reason they do this is the calorific value is 12,000 kJ per kilogram on average and significant district heating schemes can be run as a result. Compare that with the average calorific value in China of 4000 kJ per kilogram.

So where is the UK now in 2014? About 40% of household waste is recycled compared to about 11% 10 years ago but we are still sending 55% of municipal waste to landfill compared with the EU average of 40%. We are not yet processing 7 Mt of food waste and 90 Mt of animal arisings that could be AD treated to produce between 3 to 5 TW of electricity and less greenhouse emissions. That is 3-5 million MWH. But we have reduced household food waste by 1 Mt per annum since 2006. So what is being done in Manchester to get to a zero waste to landfill target?

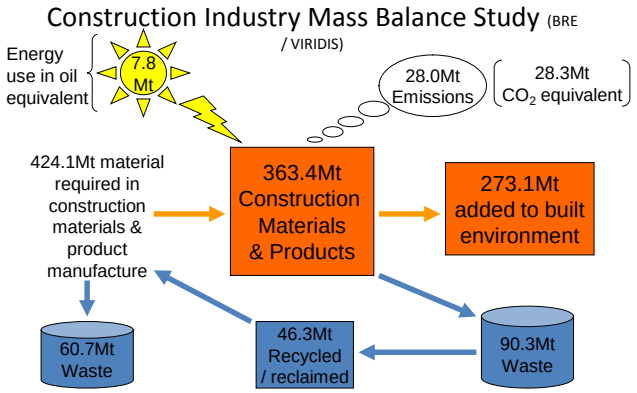
A significant part of the Manchester waste project was to engage and educate the public at all levels and in particular three new education centres were built alongside the process plants. Children not only get their hands on the rubbish (under controlled conditions) but are taken into classrooms to discover how any eddy currents can be used to extract aluminium and so on.

There are also significant initiatives throughout the metropolitan area as shown on the slide with specific targeted campaigns to capture the public imagination and improve recycling.

At the start of this lecture I said that I would only speak about domestic waste. I don't have time to look at industrial waste, specialised waste from hospitals etc. But just a note on the construction industry.

The UK construction industry discards a pyramid size of waste every two weeks and a total of 92,000,000 t from building sites every year. They have done a huge amount of work to design lean use and flexible materials, embodying longevity, later de-construction and materials recovery. There is increased use of secondary, recycled, demolished or brown field materials and particularly I have been involved with increasing standardisation and pre-fabrication offsite. Off-site manufacture is producing high quality components, minimising transportation and waste costs, and reducing the use of energy and water and CO_2 emissions. As a side issue most of my recent construction sites would have a complete lack of scaffold which has also improved the health and safety considerations.

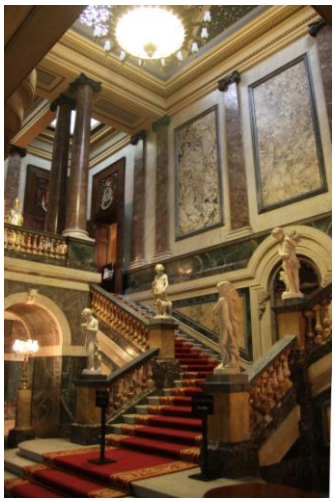
And as you would expect any good chemical engineer to do here is a mass balance of the construction industry where you can see



that 424,000,000 t of material required for construction materials results in only 363 Mt of actual materials after wastage: that results in 273,000,000 t added to the built environment and a further 90 Mt going to waste. However from that currently 46.3 Mt is recycled or reclaimed, a significant improvement on previous years.

AWARDS AND LIVERY DINNER GOLDSMITHS' HALL 15TH JULY 2014

On Tuesday 15th July 2014 Liverymen and their guests dined in the splendour of Goldsmiths' Hall under the light of 1,500 candles. The Awards Dinner is arguably the most important of our Livery Company's events and it was with pride and pleasure that monetary awards were made to 16 winners to a value of £66,000, together with medals to the Navy, Army and Royal Air Force winners. In the latter case I am always impressed at the skill and ingenuity of the male and female Service winners for the contributions they make to the success of operational missions, often in hazardous circumstances. Keeping a new ship's weapon systems continuously operational over a period of 250 days in temperatures of up to 46 degrees and constant humidity was a remarkable achievement. The successes of all the Award Winners are worth reading about elsewhere in this issue of Swordsman.



Goldsmiths' Hall is an impressive venue, matched by impeccable service from charming staff serving a tasty menu of garden pea mousse, Cornish lamb and a summer trifle, washed down with Chilean Sauvignon Blanc and Merlot. The awards ceremony after the toasts was handled with smooth style by our Clerk, and as one guest told me "…that was a quite outstanding evening; what a friendly lot you engineers are!" I think we set a very good example for our guest Masters and Prime Wardens from the Armourers and Braziers, Carmen, Shipwrights, Glaziers and Painters of Glass, Marketors, Water Conservators, Air Pilots, Information Technologists, Fuellers and Lightmongers, together with senior members of the Armed Forces, engineering institutions and of course our Award Winners and our personal guests.

The evening was rounded off by the speech from our principal guest Professor Colin Bailey, who is the Dean of Engineering and Deputy Vice Chancellor of Manchester University. You can read what he said elsewhere in this issue.

David Bawtree

THE ENGINEERING AWARDS

Hawley Award For Engineering Innovation

The Hawley Award, established in 2006, is made annually for the most outstanding engineering innovation that delivers demonstrable benefit to the environment, by a resident of the UK who is at an early career stage, holds a graduate or post-graduate degree in engineering or science from a recognised UK university and is a graduate or more senior member of an engineering institution.

Winner 2014 (Medal & £5000 Prize)
Dr Thomas Povey

Dr Thomas Povey from the Thermofluids Laboratory, University of Oxford has studied the heat transfer of cooking pans and as a result of his research has developed a striking new pan design which is very much more efficient than conventional pans when cooking on gas stoves. Pans manufactured to be suitable for consumer use outperform conventional pans by up to 40% in terms of overall efficiency. The pan has an integral external heat exchanger which extracts otherwise waste heat from the hot plume, resulting in greater efficiency of energy transfer to the

contents of the pan. In addition to penetrating the hot waste gas, the heat exchanger acts to stabilise the flame giving rise to improved flow of hot gas over the gas-washed surfaces of the pan. In collaboration with Lakeland (UK) and Nordicware (USA) the pan has been turned into a consumer product (launched 9 July and available for public sale).

Baroness Platt of Writtle Award

Originally established to recognise engineering excellence amongst those pursuing final year studies leading to academic qualifications for entry to the Engineering Council's Incorporated Engineer grade, this Award was refocused last year to those who achieved registration as Incorporated Engineer in the preceding calendar year. Named for Honorary Liveryman and Court Assistant Emeritus, The Baroness Platt of Writtle CBE FREng in recognition of her work in support of the Engineering profession in general and Incorporated Engineers in particular, the Award was first made in 2002. The Engineers' Company wishes to acknowledge the assistance of the Engineering Council and its partner Professional Engineering Institutions in selecting the winner.

Winner 2014 (Medal & £1000 Prize)
Hazel Reed

Squadron Leader Hazel Reed RAF started her career in the Army but was later commissioned as an engineer in the RAF. With 15 years' experience, mostly in the maintenance of aircraft and progressing from work as a technician on Gazelle and Lynx helicopters to commanding up to 110 technicians, she has taken responsibility for ground based aviation facilities, including management and resolution of incidents. She has devised innovative engineering solutions for the interim repair of Merlin helicopters and for a Sentry aircraft struck by lightning, produced the financial documents for investment appraisal of the £200M Hawk Future Support Project and has demonstrated the ability to lead organisational change in difficult circumstances. Clearly able to operate at all levels, from hands-on engineering to strategic asset management, Hazel is now in a senior staff post. Showing strong commitment to the wider engineering profession as a member of the Royal Aeronautical Society, she also offers encouragement of engineering as a profession for women through her work as a Guide Leader.

Stephenson Award

The Award is for those who have been particularly successful in encouraging young people to study engineering with an emphasis, but not exclusively, on mechanical engineering. In 1997, members of the Institution of Mechanical Engineers made donations to fund a Worshipful Company of Engineers Loving Cup to mark the Institution's 150th Anniversary. Donations in excess of those needed for the Loving Cup were used to establish the Stephenson Award and further donations were received from members in later years, supplemented by a substantial grant from Rolls-Royce plc. The Engineers' Company acknowledges the assistance of the Institution of Mechanical Engineers and the Engineering Development Trust (EDT) with nominations for the Stephenson Award.

Winner 2014 (Medal & £1000 Prize)
Bal Choda

Bal Choda is employed as a Project Engineer at Aston Martin. Since 2001 he has been actively involved in a volunteer role visiting schools, mentoring and inspiring young people towards STEM careers. Initial successes resulted in the Warwickshire Education Business Partnership persuading Bal to sign up as a science & engineering ambassador. Much of this commitment is undertaken on Friday afternoons in his own time and he has a very special way of securing his students' attention as he always

arrives in his Aston Martin!! Bal firmly believes that persuading young people to research and understand actual job opportunities helps to guide them through their study years and to avoid false assumptions on automatic steps into careers of their choice. He has received numerous awards to date, including a SETPOINT gold award for voluntary work in schools and a Warwickshire Education Business Partnership award for services to the community. Bal's outstanding efforts have made a difference to the lives and careers of thousands of students nationwide through his dedication, enthusiasm and communication skills.

Water Engineering Award

The Water Engineering award is made jointly with the International Water Association (IWA) for the best presentation and paper at the annual IWA UK Young Water Professionals Conference.

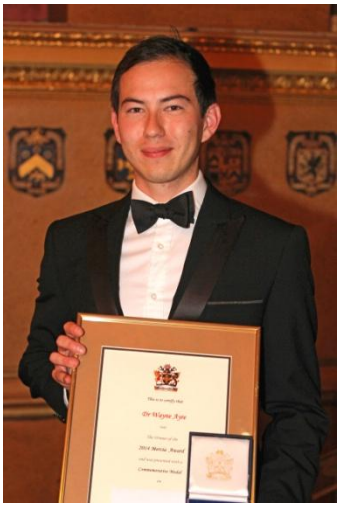
Winner 2014 (Medal) – Matthew Holmes

Matthew Holmes is a research engineer from the Stream Industrial Doctorate Programme. The concept behind Stream is that students conduct doctoral level research – in Matthew's case at Newcastle University – into a real-world problem faced by their industrial sponsors. Matthew's project is sponsored by three water companies – United Utilities, Severn Trent Water and Yorkshire Water – and he is exploring the resilience of water infrastructure to extreme events, with a particular focus on their vulnerability to failures in other sectors (e.g. power, roads etc.). He recently won the prize for the best presentation at the International Water Association's UK Young Water Professionals with a paper in which he presented an analysis of the resilience of a wastewater network and used this to illustrate how future water industry professionals are going to need to be confident in the face of uncertainty.

Mercia Award

The Award is made annually to a student under 30 for a postgraduate paper describing how engineering techniques are being used for the advancement of medical treatment and provides a medal and bursary towards the cost of a taught or research programme of postgraduate studies in Medical Engineering.

Winner 2014 (Medal and £500 Bursary) Dr Wayne Ayre



Dr Wayne Ayre is a Research Associate at the Cardiff School of Dentistry where he is developing and testing novel antimicrobial dental cements using culture techniques and co-culture models. He graduated in 2009 from Cardiff University in 2009 with First class honours in Medical Engineering, progressing to a PhD in Mechanical Engineering in 2013 developing and testing novel formulations of bone cements. His paper describes interdisciplinary research at the Arthritis Research UK Biomechanics and Bioengineering Centre of Excellence to develop more effective biomaterials to reduce infections in joint replacements. The interdisciplinary approach was achieved through collaboration between the Cardiff Schools of Engineering and Pharmacy where a novel antibiotic delivery system was developed for bone cement, demonstrating very promising results.

Cadzow Smith Award

Established in 1996, the Cadzow Smith Engineering Awards were endowed by the Eastern Group plc in recognition of the outstanding services to engineering of its former Chairman, Dr James C Smith CBE FREng FRSE now a Past Master Engineer. The Awards are for excellence on an accredited undergraduate engineering course conducted at one of eleven universities

within London and the Home Counties. Besides academic excellence, the recipients of the Awards must have demonstrated self-confidence, professional awareness, leadership and sound common sense.

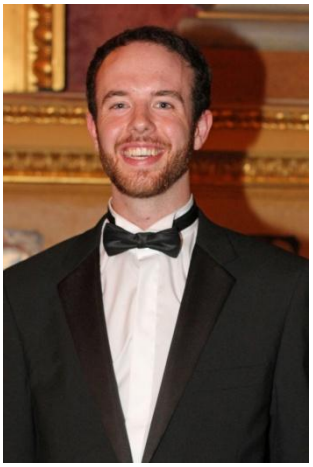
Winner 2014 (Medal & £2500 Prize) Rose Kinsella

Rose Kinsella is a final year undergraduate at University College London where she is studying for a MEng degree in Biochemical Engineering.
Motivated in her pursuit of engineering by a desire to be creative and to provide benefits to a large number of people, she is mature beyond her years with excellent communication skills. She is hugely enthusiastic for her area of study which is the treatment of retinal degenerative disease by cell therapy and in particular the scaling up of laboratory production processes to allow wide clinical use. Rose has ambitions to work in the commercial implementation of life sciences in general.

Leete Premium Award

Established in 2012 under the Will of Liveryman Dr David Leete for the purpose of making awards in what Dr Leete called Production Engineering Research but defined sufficiently broadly to encompass the whole field of what is now known as Manufacturing Research, an initial agreement has been made with the Institute for Manufacturing, University of Cambridge, to provide a "premium" above normal Departmental Training Awards to be awarded to their best new PhD research student in 2013 and in each of the following two years. Eligibility is restricted to UK Nationals whose prospective projects do not benefit from CASE awards and the £18,000 total award is staged over 3 years of PhD study subject to sustainment of satisfactory performance.

Winner Academic Year 2013-2014 (£6000 Award) – Jonathon Parkins



With a background in physics, precision engineering and machine development, Jonathon had already demonstrated a high level of engineering skills and competencies during his MSc at Cranfield (being in the top 5% of his class) and excelled on the MRes course in Cambridge. The outputs of his MRes dissertation showed that he had a flare for research, a strong intellect, and an imagination that would prove useful in his very challenging research topic.

Of the potential applications for the laser control he set out to research, he has settled on a bio-medical one and has a target of making a production ready system which sounds to have great potential. Specifically, Jonathon is currently working to develop a new process for rapid fabrication of biomedical components using laser additive manufacturing.

Additive manufacturing allows for accurate production of arbitrary shaped structures from metal powders, enabling a porous structure to be built on the surface of implants, aiding bio-integration. One particularly common part is an acetabular cup - part of a hip replacement. However, for these parts the supply capability of a machine falls far behind the demand.

By developing a dedicated solution for the part, the throughput of such components can be increased significantly. A new laser scanning system is being designed for control of high power lasers (1 kW and upwards) with rapid scan speeds and variable spot size. This will enable fast energy deposition rates combined with management of thermal gradients and residual stresses. The balling effect observed in powder consolidation technologies will also be addressed with this flexible beam delivery technique. The research output will be a complete solution for

manufacturing acetabular cups at higher rates than are currently possible.

Royal Academy Of Engineering MacRobert Award

The Royal Academy of Engineering MacRobert Award is the premier prize for UK innovation in engineering. It seeks to demonstrate the importance of engineering and the role of engineers and scientists in contributing to national prosperity and international prestige. It is awarded annually for an outstanding example of innovation and benefit to the community, which has also achieved commercial success. The award honours the winning company with a gold medal and the team members with a prize of £50,000. The Engineers Trust is supporting the Award with £20,000 annually for 10 years.

Winner 2014 (£50,000 Prize) – Cobalt Light Systems Ltd

Cobalt Light Systems Ltd have developed a means of analysing the composition of chemicals sealed within any non-metallic container without opening it, providing detailed and exceptionally reliable results in just 5 seconds. Initially this was used to help pharmaceutical companies in quality control. Cobalt has now applied it to a security machine which will enable airports to remove the existing hand baggage liquid ban through phased implementation over the next few years, in line with existing EU regulations.

THE SERVICES ENGINEERING AWARDS

The Services Engineering Undergraduate Award

Awarded to an officer graduating from the Defence Technical Undergraduate Scheme (DTUS) who has achieved outstanding academic performance and demonstrated clear leadership and commitment to a professional engineering career in the Armed Forces.

Captain Edward McCann REME, a Corps of Royal Electrical and Mechanical Engineers sponsored In Service Degree Officer in the Defence Technical Undergraduate Scheme (DTUS), graduated from Aston University in July 2013 with a First class honours degree in Automotive Product Design. His degree classification accurately reflects both his academic ability and the enormous amount of hard work he put into all 3 years of his university education. Furthermore, his contribution to the training, mentoring and development of the DTUS bursars was outstanding and this together with his academic performance proved him to be a superb all-round young officer.

The Services Engineering Postgraduate Award

Awarded to an officer completing a postgraduate technical degree who has achieved overall academic excellence and contributed most to the advancement of technical knowledge or its application through a research project.

Lieutenant Peter Hanley RN performed strongly throughout the post-graduate Nuclear Reactor Course to obtain an outstanding overall mark of 75%, placing him first in an unusually strong cohort. He impressed with his insightfulness, diligence and perseverance. In lectures, he

displayed keen intelligence, showing a high level of understanding across the full range of subjects. In the project phase he impressed with his ability to extract, interpret and critically evaluate data, producing a comprehensive assessment of the consequences of the Fukushima accident. Responding well to scrutiny from external examiners during the project presentation, his work was highly commended, gaining a distinction.

Both of the Awards above were made on the recommendation of the College of Management and Technology, part of the Defence Academy of the United Kingdom at Shrivenham, Wiltshire.

The Services Operational Engineering Awards

Awarded to an officer, from various Service and Corps areas, who has best made the application of professional engineering judgement or technical innovation to contribute significantly to the maintenance or enhancement of operational capability or effectiveness in any theatre of operations, including the UK. Recommendations for the Operational Awards are made by the Senior Specialist Services Authority appropriate.

Royal Navy Operational Engineering Award

The extremes of heat and humidity present in a Gulf summer place extraordinary pressure on people and machinery. That HMS DRAGON (a Type 45 or Daring-class air-defence destroyer) was able to operate successfully, and if necessary fight, was down to the exceptional engineering skills and leadership displayed by **Lieutenant Commander John McCombe RN**; he inspired his team and supporting authorities to do their utmost to keep going in 46 degree heat and constant humidity. He was able to maintain availability of systems to the Command for 250 days with only 5 days of unplanned unavailability through his skills in problem solving, developing innovative solutions and leading his team to success. HMS DRAGON's input in theatre was judged by the Operational Commander to have had lasting international significance; a fitting tribute to Lt Cdr McCombe's professional engineering judgement.

(*John has subsequently been appointed to the rank of Commander RN*)

Royal Engineers Operational Engineering Award

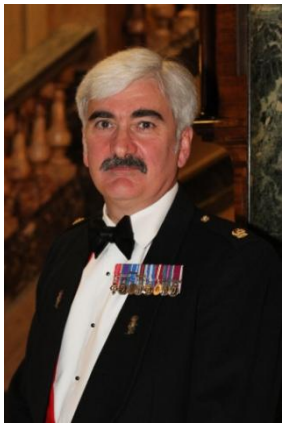
Lieutenant Greg Vinall-Hough RE led the construction of a bespoke access ramp whilst concurrently delivering engineering support to flood relief in the Somerset Levels and tidal defences at Chesil Beach. In all three tasks he applied excellent engineering acumen to overcome thorny engineering problems and displayed exemplary leadership throughout. Whether ensuring unbroken fuel supply to a critical pumping station removing $7m^3$ of water per second from a flood stricken community or hosting a visit from David Cameron, this young officer was not fazed. By combining the use of existing military capabilities in a pioneering and innovative way, he has also contributed to the military engineering community in concept proving a capability offering worth further development.

Royal Signals Operational Engineering Award

Captain (Technical Officer Telecomms) Daniel Fielding R Signals was the lead communications and information services engineer for Operation HERRICK 18. As such, he was pivotal to ensuring the exemplary provision of

these services across Afghanistan during a period of unprecedented change dominated by a programme of base closures and transition, including the move of Headquarters Task Force Helmand; a move cited as the largest and most complex move of a British headquarters on operations since 1945. The co-ordination of installation design, the equipping of each new build and the engineering certification all fell to Captain Fielding. Through his sound planning, drive, infectious enthusiasm and thorough project management, the moves were delivered on time and to an exceptionally high standard. Furthermore, at the same time, the entire communications network was also upgraded and reconfigured under his direct supervision; again without a hitch. Overall, Captain Fielding delivered a peerless engineering performance in the most testing of operational conditions.

Royal Electrical & Mechanical Engineers Operational Engineering Award



Since assuming command in January 2012, **Major Jon Cheek MBE REME** has provided engineering leadership to 5 Regiment Army Air Corps Workshop REME, based in Northern Ireland. His continuous drive to improve standards and output, both in the Workshop and across the wider Regiment has garnered numerous successes. Impressive stuff but his achievements are in stark contrast to the environment in which he operates; resource constraints, manning difficulties and a backdrop of ever changing assurance from the Tri-Service regulator, the Military Aviation Authority. Major Cheek is the epitome of an operational engineer, revered by subordinates and delivering continued operational effect from barracks to support UK Counter Terrorism Operations.

Royal Air Force Operational Engineering Award

Arriving into a newly created specialist engineering post within Tactical Imagery-Intelligence Wing, **Squadron Leader Helena Ramsden RAF** established comprehensive and effective Quality and Risk Management Systems and continuous improvement processes across all areas of the Wing activity, both at home and on operations. She overhauled the management and maintenance of ageing and fragile equipment, and, showing extraordinary innovation, drove the development of intelligence exploitation networks which not only permitted greater sharing of intelligence information within operational theatres but also enabled experts based in the UK to contribute directly to the operation, thus vastly increasing the capacity, flexibility and capability of the Wing.

The Defence Engineering Equipment & Support Award

Awarded to the person who has contributed most, through application of professional engineering judgement including the use of leadership, management and technical acumen, in the acquisition of new capability or to meet material availability targets for any of the Armed Forces. The recipient can be an individual of any rank or a team from the regular or reserve Armed Forces, the Royal Fleet Auxiliary, or the MOD civil service serving in the Defence Equipment & Support Organisation with a recommendation by Chief of Defence Materiel.

Lieutenant Commander Richard Wadsworth RN is an outstanding engineer who has used his ability and strong personal presence to punch well above his weight in overseeing the design of the Type 26 Global Combat Ship. Against

considerable opposition, he has taken an adequate but poor design of the chilled water system and radically improved its operability and robustness to action damage, both crucial for this supply of the ships life blood. In addition to similar optimisation of other ship systems, he has been an outstanding chairman of the "Internal Battle" working group, managing agreement of all the myriad details of how the ship will be fought internally between the RN operators and the designers. He is a young engineer, leader and negotiator of considerable note.

ARKWRIGHT SCHOLARSHIPS

The Worshipful Company of Engineers currently supports 2 Arkwright Scholars undertaking their Sixth Form studies at schools in Greater London as a potential lead-in to higher engineering studies. They are:

2012-14 **Mr Henri Taxy** – Latymer Upper School, London W6

2013-15 **Miss Laminn McLay** – Mill Hill School, London NW7

The Master's Speech

Wardens, My Lord, Mr Alderman, Masters, Ladies and Gentlemen.

Welcome to Goldsmiths' Hall. At the time that Margaret and I were planning this evening we thought a candle lit hall would be a lovely setting on a cold British summer evening. I certainly felt the heat in my Master's gown!

Tonight is a celebration of engineering achievement and sitting in this magnificent building certainly gives a strong sense of achievement and long term stability and continuity. You will have seen throughout the building exquisite gold and silver pieces made by past Freemen and Liverymen over the centuries. Deep below the building is a vault the size of a squash court I am told, which houses beautiful gold artefacts going back many centuries, each one made for a specific Master's year and much more. These are regularly cycled through the various display cabinets in the hall and some are also on our tables tonight.

A Livery Hall has stood on this site since the early 1300's and this, the third Goldsmiths' Hall was built in 1826. The Livery started as associations to regulate trade and to connect members of the trade to help one another both in good and more difficult times. Most Livery companies no longer have a strong link to their heritage trade but continue the traditions of friendship and fraternity and also significant charitable giving. Very much the case for the Engineers where although we are all Fellows of an engineering institution or the RAEng, there are many bodies set up to represent engineering whereas that is not our role.

Goldsmiths on the other hand still regulate their profession. The term 'hallmark' comes from people bringing gold items to this hall to be assayed - tested for the composition and quality of the metal - and then 'hallmarked'. Sitting in this room it seems incongruous that in a gallery above us some 70 metallurgists, hallmarkers and other craftsmen continue the important work of assay and hallmarking every piece of gold and silver sold in London. The original remit was only gold and silver but that has now expanded to platinum and more recently palladium.

Every year the Chancellor of the Exchequer is brought to Goldsmiths' Hall to hear the verdict of the Trial of the Pyx, led by a High Court Judge and a jury who adjudicate on the assay of the

coins from the Royal Mint. The Pyx are the wooden boxes where the coins for assay are held. This is the longest running judicial process having started in 1282 and it was moved from Westminster to Goldsmiths' in the late 1800's. For us as Engineers this is just a good example of quality assurance!

In addition to the assay role the Goldsmiths support their craft through charitable giving. In 2007 they gifted £17.5m to The Clerkenwell Centre as a focal point to develop apprentices and craftsmen in the gold trade.

My theme for this year is "the charitable role of the Livery". The Engineers' Trust has some £1.6m in assets and I am very proud that we use it for the awards being presented tonight and for other donations such as our patronage of RedR, the humanitarian skills charity. However we need to aspire to be able to do much more and it is for every one of our Liveryman to contribute to this very important work. When could the Engineers' Trust make a multi-million pound pledge to an engineering charitable cause?

On a more immediate point I would like to thank all of the Liverymen and others who have contributed money to the RedR charity challenge last month, where I led a team of BP engineers up Kilimanjaro. Margaret came along too and I can report we both made it to the top although it was the toughest combined mental and physical challenge we have ever faced. Losing 10+ lbs during the climb shows the level of physical exertion, although the side benefit is I can now wear trousers that have hung at the back of the wardrobe for many years, hence my taking the opportunity to wear my tartan trews! Margaret has some rather more graphic words to illustrate the climb!

There is still time to contribute via the Engineers' Trust and I hope to present a cheque to Princess Anne, the RedR President, later in the year.

Turning to the Award winners I would like to congratulate all of you. You are all doing great things in your various fields and it is indeed a pleasure to have you here tonight. Due to the generosity of our Liverymen we are now a partner with the RAEng in the MacRobert Award, the most prestigious annual engineering prize in the UK. It is a huge pleasure to welcome Dr Paul Loeffen, the Cobalt Light Systems CEO and 4 other members of his team. Along with all the other winners here tonight you are prime examples of the great things being achieved by many in engineering across academia, industry and the military.

We should also remember that some members of the Armed Forces are not present due to deployment on active service. I am very privileged to see at first hand the work of our armed forces, particularly the Royal Engineers, where I still hold a commission as the oil and gas industry Advisor to the army, through the Engineer & Logistics Staff Corps. Your deep professionalism and highly innovative resourcefulness to "get it done" is a credit to your instructors, leaders and most importantly you.

And now to our Guests:

As a Livery Company Master I have the great pleasure of dining at other Livery and City events. And so we are very pleased to welcome from other Livery Companies, the Prime Warden of the Shipwrights, and the Masters of the Armourers and Braziers, Glaziers and Painters of Glass, Carmen, Guild of Air Pilots and Air Navigators, Marketors, Lightmongers, Information Technologists and the Water Conservators.

And from the City we have Alderman Jeffrey Evans and from City University Professor Dinos Arcoumanis.

Also, among our Company guests, we welcome the supporters of our award winners, both civilian and military. Thank you for all that you do to support the next generations of engineers.

Many of our Liverymen have personal guests and I am delighted to welcome you here this evening. From BP I have two guests, Dan Walker and Will Pickford and also Will's wife Vickie. Both Dan and Will are Chartered Engineers and members of IMechE - I understand Dan is still the youngest Fellow to date and his application to the Engineers' Company was discussed at the Court meeting this evening. I hope the Liverymen hosting them have given the Engineers' Company

and the Master (!) a good sales pitch. The Livery needs a steady inflow of new Freeman and Liverymen.

To that end at the Court meeting earlier this evening it was a great pleasure to clothe 7 new Liverymen into the Engineers' Company. You are very welcome and we look forward to your contribution to the affairs of the Company.

I was also delighted to admit *in absentia* Her Royal Highness, The Princess Royal as a Liveryman. Royal diary permitting I hope to clothe her at our October Annual Banquet.

Finally my Principal Guest is Professor Colin Bailey, Vice-President of the University of Manchester and Dean for the Faculty of Engineering and Physical Sciences. You will hear more about Colin in a moment.

To all of our guests you are most welcome and we do hope you enjoy the evening with us.

I would now like to ask members of the Worshipful Company of Engineers to rise and toast "Our Guests".

BP and the University of Manchester have a very close working relationship and through that it has been a great pleasure to get to know Colin Bailey.

Colin graduated from the University of Sheffield with a First Class degree in Civil and Structural Engineering. He was also awarded a PhD in Civil Engineering and Structural Engineering, from the University of Sheffield, following his studies into the behaviour of buildings subjected to fire conditions. He has been awarded 8 prizes for his research work.

He then worked for the design consultants Lovell Construction, Cameron Taylor Bedford, and Clarke Nicholls Marcel. He has also worked for The Steel Construction Institute (SCI) and The Building Research Establishment (BRE), where his practical and research experience resulted in significant developments in the field of structural engineering. His main specialties are fire safety engineering, membrane action, wind loading, and steel-concrete composite systems. He is author of over 100 research papers and practical design guides.

Colin is a Fellow of the Royal Academy of Engineering (FREng), a Fellow of the Institution of Civil Engineers (FICE), a Fellow of the Institution of Structural Engineers (FIStructE), and a member of the Institution of Fire Engineers (MIFireE). He has established a pre-eminent global position in the field of structural fire engineering and has been the lead expert in reviewing the structural fire design on a number of iconic buildings in London, including The Shard, The Pinnacle, Heron Tower and Leadenhall. He has also been an expert involved in explaining the collapse of the World Trade Centre 7 Building in 2001, following the terrorist attack.

In his role as Vice-President, Colin contributes to the strategic leadership and operational management of the University as a whole to ensure that the University reaches its mission of becoming one of the leading universities in the world whilst maintaining its distinctiveness.

As Dean, Colin is responsible for the strategic leadership and operational management of the Faculty of Engineering and Physical Sciences, with an income of over £220m, over 10,000 students and over 1,900 academic and support staff. This involves developing strategic leadership in research, higher learning and social responsibility, whilst ensuring that operational processes are efficient and effective. He has taken a lead position in developing links with industry and over the past five years almost 1000 BP engineering and project leaders have attended the joint Engineering and Business school residential programme at Manchester. More recently BP has invested $100m in the ICAM - a consortium of universities based at Manchester with some 50 postgrad researchers pursuing PhD's across a wide range of leading edge materials research. That is only a small snapshot of a much wider portfolio with Nobel prize winners, Graphene and much more. The future at Manchester is really exciting and Colin is leading the way.

It is a great pleasure to have Colin here tonight as my Principal Guest.

Speech by Professor Colin Bailey

Wardens, My Lord, Mr Alderman, Masters, Ladies and Gentlemen, it is a great pleasure to be here tonight and thank you for inviting me. As some of you will know, I'm a Civil and Structural Engineer. I remember some years ago, my wife asking me what exactly it was that I did. I replied by saying that I design buildings, bridges, the odd tunnel, and explaining in great detail the project I was working on at the time, involving an extensive foundation which incorporated some very large bored piles.

Some days later my wife was flicking through the Yellow Pages and all of a sudden shouted, "*Colin, now I understand what you do! Look the index in the Yellow Pages states:* ***Boring - see Civil Engineers****!"*

You might be interested to know that in August 1996 the Yellow Pages revised their index following lobbying from the Institution of Civil Engineers. Personally, I felt the Institution should not have got involved!

This reminds me of a story that I've heard and it goes like this:

Two engineering students were walking across a university campus when the first one said, "Where did you get such a great bike?" The second Engineer replied, "Well, I was walking along yesterday, minding my own business, when a beautiful woman rode up on this bike, threw it to the ground, took off all her clothes and said, "Take what you want." The first Engineer nodded approvingly and said, "Good choice; the clothes probably wouldn't have fitted you anyway."

This actually highlights an important point relating to the public's perception of Engineers. When you meet someone for the first time (who is not an Engineer!) and after the initial pleasantries they ask, "*What is it that you do*?" How should we reply?

A quick search on the internet gives a number of definitions for an Engineer. A good one is: "*Engineering is the application of scientific, economic, social, and practical knowledge in order to invent, design, build, maintain, and improve structures, machines, devices, systems, materials and processes".* We may all agree this is a good summary, but perhaps too long to use when asked at a social event, or even when you meet someone walking down the street.

When asked, *"What does an Engineer do?*" I answer, "*We shape and influence the world we live in*". It is this message that we need to get over to the public, since it sums up exactly what we do. It is only then that the public perception, and the standing in society of Engineers, will change and parents will feel as much pride in talking about their children becoming Engineers as they do about them becoming Doctors.

I have spent about half my working life in industry and the other half as an academic. When I entered academia, as a Professor of Structural Engineering, my partner once again asked me, "*Now, what is it that you do?*" I explained that I teach Structural and Civil Engineering, prepare the next generation of Engineers, research new aspects of engineering and carry out some consultancy, all as a newly appointed academic. Then one evening she was looking through the Oxford Dictionary and said, '*Colin, now I understand what you do! Look here is the definition of academic';* and I quote, *"Not of practical relevance; of only theoretical interest!"*

The editors of the Oxford Dictionary should perhaps visit Manchester, where we ensure our graduates have the necessary breadth of practical and theoretical skills to further their careers. Our research in engineering and physical sciences is linked to over 300 companies, as well as our research underpinning numerous spinout companies. A recent example is the graphene light-bulb, which we are looking to take to market, which uses less energy and lasts longer than the current leading light-bulb.

Now, if you will bear with me, I would like just to give you a quick overview of my career. I would have liked to say that my career was the result of a well-executed plan, but this would be far from the truth. The reality is that I have been extremely lucky and everything has, in fact, happened totally by chance. Having left a local all-boys comprehensive, with a few O-Levels to my name, I answered an advert in the local paper to join Lovell Construction on just under £2,000/year as a trainee draftsman. Luckily, the trainee job was linked to studying for an ONC at Slough College, for one day and one evening per week. After 2 years I joined a company located in South Kensington, called Cameron Taylor Partners, as a reinforced concrete detailer. I remember convincing the company at the time to allow me to study for a HNC at Twickenham College, which they kindly supported, with again one day and one evening spent studying. I then joined a company called Clarke Nicholls and Marcel as a Design Engineer. At the time I was well paid, since it was the late 1980s and there was an excess of work and shortage of Engineers in London. Due to my HNC, and work experience, I could use the design codes and design anything 'standard' in concrete, steel, masonry and timber. There are a number of buildings dotted around London, still standing, that I have designed.

Interestingly, looking back, I could use the design codes but I was not educated in the basic principles underpinning the codes and so, as a designer, I had significant limitations. At the time I was also supporting graduates, who were joining the company, and I could see them following a clear career path of upwards progression through the profession. This led me to think that perhaps I 'needed a degree', so I starting investigating whether this was a feasible option, or something beyond my reach.

I applied to The University of Sheffield and was accepted first time. I remember my parents and friends at the time asking, "*What are you doing, are you mad?*" I was in a very well paid job, had a car, enough money to look for a flat, and a great social life. No one knew anything about University – including me! But I decided to take a chance and took the leap.

Looking back, I do ask myself would I have taken the risk of going to University with the current £9,000 fees. At the time I paid no fees and even got a small grant! Of course students now get loans, which they pay back once they are earning above a certain threshold. But would I have taken on the loan? The answer is, almost certainly, no! When we talk to young people from less privileged backgrounds, the concept of a loan is seen as very dangerous and to some families a loan automatically translates to 'a knock on the door from the debt collector.'

As a country, if there continues to be some parts of society that do not consider going to University, then we are missing out on a wealth of talent. At Manchester, we are working with alumni, supporters and industrial partners to help all students who have the academic ability to attend our University, irrespective of their background. I do hope, if the opportunity ever arises, that you all would help in supporting students from less privileged backgrounds.

So what did I gain from doing a University degree? It taught me the basic principles of design and I was no longer reliant on following codes 'blindly'. However, more importantly, it also taught me the art of creativity, problem-solving skills, communication, team-working, sustainability, and how the engineering profession can influence and shape the world we live in.

I recall someone from industry telling me recently; "*Colin, all we want you to do is teach your students to use the design codes."* I replied, "*Absolutely not - that's not what a University education is for*".

Returning to my career, having finished my degree in the early 1990s, I was eager to re-enter the employment market as quickly as possible, waving my shiny First Class degree certificate. But the construction sector had collapsed. I did, however, get offered one job but that was on less money than I was earning when I left Clarke Nicholls and Marcel three years earlier! How could I possibly explain this to my family and friends considering their previous views about my decision to go to University?

Thankfully, having finished top of my year, I was offered the opportunity of a scholarship to study for a PhD, which I quickly accepted. Although perhaps I did not fully appreciate it at the time, what an opportunity this presented! I studied under two great supervisors and carried out research into the behaviour of buildings subjected to fire. I still continue to carry out work in this area, and I have had the opportunity to be involved in the design of a number of projects, including the Shard, the Pinnacle, Heron Tower and Leadenhall.

Following completion of my PhD, I worked for the Steel Construction Institute in Ascot and the Building Research Establishment in Watford, both great jobs. It was in 2002 that I saw an advert for a Professor of Structural Engineering at Manchester, and decided to apply. And so, I joined The University of Manchester, became an academic and never looked back!

What a privilege it is to be able to teach and research the profession I love. My strong view about higher education is that research and teaching within universities should go 'hand-in-hand'. Through research, we continue to push the boundaries of knowledge in our profession. This research feeds into our teaching, allowing us to produce excellent Engineers for the future; Engineers that our country so desperately needs.

One thing I would say about the quality of the students coming to University, is that we must stop saying (especially in the media) that A-levels are getting easier! It's simply not fair on the students who have studied very hard for their A-levels! Of course, we could sensibly talk about whether the curriculum that they have studied actually prepares them adequately for University. We have just seen a Cabinet reshuffle, with the introduction of some new Ministers. Due to my allocated time I will not drift into political debate. I would, however, make the comment that no matter how good your policies are, without buy-in or enthusiasm from the sector to enable implementation, it's going to be very difficult to make the change that is perhaps needed.

Since joining Manchester, I have found myself being drawn to the management side of the University, first becoming Head of School/Department, then Vice-President and Dean and later this year, I will take on the role of Deputy President and Deputy Vice Chancellor. These roles have given me a great opportunity to help influence the direction of the University.

For example, in order to provide students with a second chance to go to University, we run a foundation year at Manchester with support from alumni and industrial partners. Currently, if a student wants to study Physics and Astronomy at Manchester, they will need a minimum of three A-levels at A*, A* and A. Despite this, we can fill the course twice over! There are some local inner-city schools in Manchester and elsewhere, where the students simply have not got a chance of getting these grades. So our foundation year gives them another chance. However, this involves an extra year at University, so financial help through scholarships is needed.

We are also continuing to improve our links with industry, which is critical to support economic growth in the UK. One example of this is our collaborative work with BP on executive education and research, but there are many more.

Another area, which we are looking at, is the employability of students from less privileged backgrounds. As already mentioned, we have a number of initiatives in place to encourage students from all backgrounds to come to University. However, there is evidence that post-degree employability of students from less privileged backgrounds is not as high as other students, with equivalent qualifications. Why is this? We must continually ask ourselves whether the staff within our organisations is diverse enough. If it is not, we should explore whether there is some unconscious bias during the recruitment process which may be resulting in less diverse staff. We all know that the best design and management teams are the most diverse!

Although I did say that I will not drift into politics, I must just mention some government policies that are detrimental to universities. The UK's immigration policy has been challenging. Overseas students are essential to this country. Our universities are international universities and having international students on campus is a great experience for all our students, especially our UK

students. Overseas students also provide inward investment to universities and the UK science and research base. They also provide investment into the economy. Attracting overseas students also supports our foreign policy, but without doubt the most important fact is that overseas students result in long-term business relationships. These relationships are essential to the future of this country. The issue with the immigration policy at present is that we are sending a negative message overseas; a message that suggests the UK is not 'open for business'. There have been many times when I have travelled overseas and I have heard the message, "*We are not welcome in the UK"*. We must ensure that we address this incorrect perception as a matter of some urgency! The UK is 'open for business' and we need to attract overseas students and investment.

There is currently a suggestion in the press that Labour is considering reducing student fees to £6,000. This will of course reduce funding to universities which will need to be addressed by government funding, especially for high cost subjects such as engineering. I have already mentioned fees, and their impact, but my strong plea to the government is, *"Please can we have stability!"* Education in this country is too important; we need long-term policies that improve our education base. Of course the votes from the student body are significant, and can swing marginal seats, so perhaps I'm asking too much!

I have already mentioned the need for diverse design and management teams. This also includes the need to get the gender balance right. We are working across the sector to get more women into engineering, but numbers remain stubbornly low. We all know women are much better than men at a lot of things! This reminds me of a story that I heard and it goes like this:

The Secret Service had a position available for an assassin. After all of the background checks, interviews and testing were done, there were three finalists - two men and one woman. For the final test, the assessors took one of the men to a large metal door and handed him a gun.

"We must know that you will follow your instructions, no matter what the circumstances. Inside this room you will find your wife sitting in a chair. You have to kill her." The first man said, "You can't be serious, I could never shoot my wife." The agent replied, "Then you're not the right man for this job." The second man was given the same instructions. He took the gun and went into the room. All was quiet for about five minutes. Then the agent came out with tears in his eyes. "I tried, but I can't kill my wife." The agent replied, "You don't have what it takes, take your wife and go home."

Finally, it was the woman's turn. The assessors explained, "We must know that you will follow your instructions, no matter what the circumstances. Inside this room you will find your husband sitting in a chair. You have to kill him." She took the gun and went into the room. Shots were heard, one shot after another. They heard screaming, crashing, banging on the walls. After a few minutes, all was quiet. The door opened slowly and there stood the woman. She wiped the sweat from her brow and said, "You guys didn't tell me the gun was loaded with blanks, so I had to beat him to death with the chair."

Tonight, I have tried to get over a number of important messages. These are:

1. We must improve the public perception of an Engineer. As Engineers we shape the world we live in!
2. We must ensure that those with the academic ability have the opportunity to go to University, irrespective of their background.
3. We must increase the employability of students from less privileged backgrounds, get more women to choose engineering as a career, and ensure we have truly diverse design and management teams.
4. We must ensure a greater connectivity between universities and industry.
5. We need to support education within the UK, which is fundamental to the future of the country. We need a long-term strategy and not short-term policies that are driven by votes in marginal seats.

When I was planning what to say tonight, I promised myself that when I saw the seventh person yawning I would sit down. I've so far counted six, so I'll quickly start to conclude! However, before I finish, I would just like to say that there is an old observation about after dinner speeches, and it goes like this:

You actually make 3 speeches. The first is the one you make to the bathroom mirror before setting out; the second is the absolute drivel you say when you stand up to speak; and the third is the magnificent and witty speech you convince yourself you have made as you're driven home in the taxi.

I have completed the first 2 and I now look forward to the last! Thank you so much for your patience.

I would now ask you to be upstanding and raise your glasses. "*To The Worshipful Company of Engineers, may it flourish root and branch forever!*"

ANNUAL GOLF DAY AT MENTMORE GOLF AND COUNTRY CLUB 30th July 2014




What starts with renewing friendships in glorious summer sunshine whilst fuelling up with bacon baguettes and coffee? Answer – the 2014

Engineers Livery Company annual Golf Day and More.

This year's event was held at The Mentmore Golf and Country Club. The Club lies close to the Chilterns and is overlooked by the imposing Mentmore Towers, the magnificent country home built for Baron Meyer Amschel de Rothschild. Its front lawns and gothic façade have featured in the Bat Man series of films – Gotham City in the heart of the Shires no less! Situated on the borders of Buckinghamshire, Bedfordshire and Hertfordshire, the Club's two superb 18-hole Championship courses, The Rothschild and The Rosebery, track over rolling parkland and feature lakes, woods and spinneys. Established in 1992 the Club was opened by Irish star, David Feherty and European Ryder Cup captain, Bernard Gallacher. Our 17 competitors played on the Rothschild course.

For the non-players there was a tour, organized by the Master's Lady, to visit the magnificent Waddesdon Manor. Built in the late 19th Century in the style of a French Chateau by Baron Ferdinand de Rothschild, it is an outstanding example of its kind surrounded by extensive gardens and woodland and considered a jewel by the National Trust.

And so to our competition played in warm sunshine throughout. As our players soon discovered the course offered a fair and pleasant challenge to golfers of all handicap standards! The fairways were firm from the recent spell of hot weather and this made for good distance off of the tee. The greens were in

excellent condition and required just the right weight and correct line to sink the putt. Players who ventured too far off the fairways into the 'jungle rough' soon had to kiss goodbye to yet another ball! Well placed bunkers caught even the experienced players as the dry conditions often produced unexpected bounces and roll.

Warm, thirsty but in good spirits the golfers relaxed in the Clubhouse before being joined by the Touring Ladies who had similarly enjoyed an excellent day – not to mention the Cream Tea! Transport was dispatched to the nearby Cheddington railway station to pick up The Master before retiring to the Rothschild Suite to enjoy a convivial dinner overlooking the scene of our earlier golfing trials and tribulations. Dinner drew to a conclusion with the presentation of prizes and words of thanks from The Master - together with an explanation of why he had not signed up to play golf!

As none of our esteemed golfers managed to get on the second green with their tee shot, the Prize for Nearest the Pin in One went unclaimed! Not so the Nearest the Pin in Three which was won by Richard Rooley.

This year's winner of the Ladies prize and overall best score with 38 points was Jenny Kay for whom in her own words 'it all came together today'. Runner up in the Men's competition was Andrew Cullimore with 32 points.

Winner of the Men's Competition and winner of the Livery Trophy with 37 points was – myself. It was muted that there should be an insider information enquiry due to this being my home Club!

Overall, all had a most enjoyable day and we are intent on encouraging more participants for the Golf, Tour and Dinner in 2015, which will be held on Wednesday July 22nd. We will again play on the Rothschild Course. The Course will be superbly presented as it is the venue for a Professional Tour Competition to be played the preceding two days!

John and Helen Ferrie

INFORMAL MIDLANDS DINNER HAMPTON MANOR HOTEL 15th August 2014

Twenty-seven members of the Company assembled in the Warwickshire village of Hampton-in-Arden for the annual Midlands dinner on a beautiful summer evening in August. Once again expertly organised by Penny Taylor, the evening was hosted at the Hampton Manor hotel, a building with links back to Sir Robert Peel of the policing fame. More of him later.

Whilst aimed at our members in the Midlands, the dinner attracted members from far and wide. Our Master John Baxter and his wife Margaret attended, as did Past Master David Scahill and Gillian.

Sir Frederick Peel built Hampton Manor as attribute to his Father, the 19th Century Prime Minister and founder of the police, Sir Robert.

The Manor is a mirror image of Sir Robert's home in nearby Tamworth and is well-maintained to this day with mature gardens and a protected arboretum.

We dined in the library, still remarkably well stocked with titles from across the years. Beef fillet and serrano-wrapped chicken breast were well-accompanied by the hotel's wine list. Of almost predictable fascination to a room of engineers were the triple egg timers used to advise diners when to pour tea and coffee from the teapots and cafetieres respectively. Further debate on the efficacy of these devices was offered on one table by the presence on that table of two physicists accompanying their engineering partners.

When addressing us after dinner our Master showed himself to be a student of the American poet Oliver Wendell Holmes Snr who once famously said, "*nothing conduces to brevity like a caving in of the knees*". A succinct speech allowed prompt adjournment to the Manor's bar and its impressive array of products from our Master's native country.

Hopefully this dinner will continue in future years. Members from the Midlands and further afield will no doubt be made to feel most welcome.

Patrick Waterhouse

VISIT TO THE NATIONAL LIFT TEST TOWER 19th August 2014

The National Lift Test Tower in Northampton is a 127m tapered tower with a jagged top. This iconic structure is visible for miles around and was dubbed the "Northampton Lighthouse" by Terry Wogan – he argued that it was highly successful because no ship had ever struck it! (*In fact, the furthest inland lighthouse in the UK is at RAF College Cranwell - an operational aerial lighthouse).* Twenty Liverymen and their wives met at this landmark, now incongruously surrounded by housing, for the visit.

Dave Cooper gave us an introductory presentation covering the history of the tower and lifts. HM The Queen opened the tower in November 1982. It has a diameter of 14.6m at the bottom tapering to 8.5m at the top. Irregular-shaped through-holes to break up the vortex effect were left to make the tower reasonably stable in high winds. The tower was built by the Express Lift Company to test their lifts and remains the only such facility in the UK. When the company was taken over by Otis Lifts in 1997 the factory was demolished and the land developed for housing. The tower was saved from demolition but fell into disuse until it was purchased and refurbished by a local businessman. The building became available for use commercially in 2009.

Dave covered the various types of lift drives as well as the different types of door openings. We heard about the importance of designing the lift system properly (number of lifts, types of door and lift call handling arrangements) when designing buildings. He gave an example of a London office block where a very poorly designed lift system caused queues out of the building in the morning and the only way the problem could be solved was to reduce the number of people using the building! A recent innovation is the Hall Call system where users enter the number of the floor they want on a keypad in the hall rather than in the lift itself. The lift then works out the most efficient journey for the waiting passengers. Systems are now being developed where a lift will be called once a person swipes through an entry

gate, based on that individual's work location. And for those who have wondered why you "call" a lift, this is a hangover from the days when you literally called up to the "bell hop" the floor that you required.

The General Manager, Ed Wright, gave us a tour of the facilities. The tower is used for research, development, testing and training. There are 6 lift shafts of varying heights up to 120m and a fully equipped 30m drop test shaft. Additionally, there are various large vertical spaces, including a 95m space fitted with tracking cameras to observe and record experiments. Ongoing projects include work on height safety and access equipment and escape systems for offshore platforms and vessels.

Looking up....and down....from the middle!

The construction of the tower itself is interesting. There is a less than 10mm error from vertical over 30m sections of the tower. And, to allow for expansion, the floors in the tower are not joined to the walls. The views over Northamptonshire from the observation platform at the top of the tower were stunning. There is a large transmission dish at the top and high speed broadband can be squirted to local businesses. Charity abseiling takes place on the tower (only for the brave) and it is intended to use the internal space for abseiling as well. We also heard of plans to cover the tower in a cable mesh. An LED will be mounted at the 6 inch mesh centres and each LED will become a picture pixel. The tower is used by the University of Northampton to carry out research experiments and is also used to test novel lifting designs. One recently conducted set of tests involved using a scale model of a tandem hoist system for lifting heavy, unbalanced loads from the seabed.

Our party then transferred to the University of Northampton which is the only institution worldwide offering educational courses to support employees throughout their lift engineering careers. They have had very close ties with the Lift Test Tower for many years. After an excellent buffet lunch we had presentations by the acting Dean and by the Professor of Applied Mechanics who is responsible for the Lift Engineering courses. Dave Cooper rounded off the visit with a presentation on accidents involving lifts and escalators. The conclusions were clear – lifts are safe places but escalators are to be treated with the greatest respect.

Our thanks go to Dave Cooper for arranging this highly informative and interesting visit. What the world largely takes for granted when using lifts and escalators actually involves a huge amount of detailed design, complex technology and rigorous safety testing (no surprise to us engineers). We can all step into a lift happy about its safety – but watch those children and grandchildren on escalators.

Peter Liddell

MASTER'S OUT OF TOWN MEETING, GLASGOW 18th to 20th September 2014

Informal Dinner in the Megalithic Suite of the Radisson blu Hotel Thursday 18th September

Whilst looking forward to the Out of Town in Glasgow as a venue and meeting friends old and new, both Gillian and I had a sense of foreboding, because of the Scottish Referendum. From an English Southerners perspective, we desperately wanted to keep our family of nations together and with the polls looking evermore balanced, there was the potential for imminent loss.

As we all know the media coverage had built up the referendum to a crescendo and deep divisions were starting to appear in Scotland, Wales and England. How was all this turmoil going to

resolve itself and what was the atmosphere at 'Glasgow Central' going to be like?

As we all arrived during the afternoon, a small group of us wandered up Buchanan Street amidst the crowds of Saltire waving 'Yes' voters and a few 'No' voters trying to put their views across. All was fairly good natured (the police presence making sure of that!). For the less organised, though, one of the reasons for the expedition was to look for tartan items for later in the weekend.

Set against this backdrop, was the Engineers 'Out of Town' opening dinner and therefore, with an eye on the polls our first event started. We assembled in the foyer of the Megalithic Suite for the reception and whilst catching up with friends, we were asked to participate in a sweepstake, on the outcome of the Scottish referendum. (Personally, out of our tickets purchased, three were for a significant Yes victory and this again took its toll, despite Richard's kind words.)


On being called for dinner we made our way to our respective tables and there was a buzz of anticipation, when our Master rose to welcome us all to Glasgow, his home city. He explained that the programme was full and varied and had significant memories for him. John went on to express his personal concern regarding the outcome of the referendum and invited like minded people to join him in the bar, throughout the night, to witness the returns.

Richard and Janet always put so much effort into the fund raising and this year was no exception. Richard introduced the Silent Auction with some excellent lots to bid for. These included a week's accommodation in the Algarve, a box for five at the Royal Albert Hall and an overnight stay for two at the Hotel 'Penny and John' in Solihull. We could personally vouch for the Hotel 'Penny and John', having stayed there after the excellent mini OOT at the Hampton Manor Hotel.

On the table was the most useful photo montage, with the most flattering and glamorous photos. I must say that at least this year I was not likened to Bill Clinton! The meal and company were excellent and on our table the conversation even strayed from the referendum. This year we had two photographers, John and John, both on our table, who captured the evening most professionally, as evidenced by pictures included here.

All too soon the dinner was over and the stalwarts adjourned to the bar, not we might say for the whole night. It was with considerable relief that when we turned on the Television at 6:30am there had been a NO result, which belatedly for us brought the first event of the Out of Town to a most satisfactory close.

Barry Gasper

Visit to Hunterston B Nuclear Power Station Friday 19th September

On Friday morning approximately half the party boarded a coach at the challenging time of 08.00 hrs for a visit to Hunterston B Power station located on the North Ayrshire coast. After an uneventful journey we arrived to find not one but two power stations, the first being an old Magnox reactor, which is being decommissioned and we were informed that the decommissioning will take 60 years before the public will be permitted to walk over what will eventually be a landscaped site.

However we were destined for Hunterston B which is a more modern Advanced Gas-cooled Reactor,

which was first commissioned in 1976 with a design life of 30 years. The design life has been extended for a further 17 years to compensate for the decommissioning of a number of coal based power stations. The introductory talk which included a safety & security briefing stressed the intricate safety measures in place and also the need for visiting parties to pass through security doors within 10 second intervals to avoid local klaxon alarms being activated. We were split into several parties and each one was able to report the perfect operation of the various klaxons when the time limits were not achieved.

The plant is operated by EDF Energy who took over from British Energy in 2009. One of their many initiatives had been to reverse the policy of the former operator and encourage visits by schools, university students and the general public, in order to further the understanding of nuclear power and its potential to make a meaningful contribution to the future energy needs of the United Kingdom. The Plant is operated under a "Site Licence" which is granted by the Office for Nuclear Regulation. This is a legal document, issued for the full life of the facility. It contains site-specific information, such as the licensees address and the location of the site, and defines the number and type of installations permitted. A set of 36 Standard Conditions, covering design, construction, operation and decommissioning, is attached to each licence. These conditions require licensees to implement adequate arrangements to ensure compliance.

The plant was originally designed to withstand earthquakes, flooding and fire against a 1,000 year return period, however more recently the design scenario has been increased by an order of magnitude to 10,000 years including the huge impact from an aircraft crash. Unfortunately the sensitivity of the fire alarm system is such that it is activated by sudden increases in light as well as the presence of smoke. One side effect is that all cameras, phones and portable computer devices such as tablets are banned for fear of an accidental flash setting off the sprinkler systems, all such devices had to be left on the coach or checked in before the visit could commence. So sadly this account cannot be accompanied by illustrative photographs.

There are three principal areas for the visit: the Control Room; the Reactor Hall and the Turbine Hall. Each is equipped with a viewing gallery to ensure that visitors are kept away from operational areas, while at the same time affording an excellent overview of the plant.

The Control Room is in fact two separate control rooms sharing a common but carefully delineated space. Colour coding is used by means of different coloured flooring to distinguish between the Control Room Supervisor who has blue carpet, and the Reactor Controller whose domain is red. At least in theory neither may enter the others area unless invited. Apart from the coloured carpets, the other thing that immediately strikes the visitor is the age of the control panels and desks. The plant is now 38 years old and yet most of the electrical cabinets are original and coloured "Eau de Nile" which was popular in the 1970s. They are very much bulky analogue hard wired panels, which, with the exception of Chart recorders which have been replaced with modern digital equipment, show little evidence of modern IT. This is a deliberate policy, because of the difficulty of redefining what would constitute a fail-safe mode in the event of computer or plc failure. One consequence of this approach has been the need to replace worn out and obsolete electrical equipment such switches, relays and contacts on a like for like basis. Contracts have been entered into with specialist suppliers who effectively reverse engineer and then fabricate all such parts to enable the continued operation of the plant. The interesting lesson is that it is far from simple to decide to extend the life of a nuclear plant.

On visiting the Reactor Hall viewing gallery we were told that they were part way through a planned 70 day shutdown for one of the two reactors, and as a result we would have a far better view of what was contained within a reactor vessel. In fact it is still difficult to understand fully just how complex the design is. In an AGR system the reactor core, boilers and gas circulators are housed in a single pre-stressed concrete cavity known as the pressure vessel. The pre-stressed

concrete vessel is designed to allow the pre-stressing cables to be examined and replaced if necessary. Each reactor has approximately 300 fuel channels, 260mm in diameter, which run vertically down through the reactor. In between the fuel channels there are 80 control rods. The fuel channels are filled with stainless steel fuel rods each of which contains a large number of ceramic fuel pellets. Each pellet contains uranium dioxide powder which can produce the same amount of energy as a tonne of coal. The steel fuel rods are approximately 1 metre long and 36 fuel pins are arranged in clusters within graphite sleeves to form each fuel element, eight of which are linked together with a tie bar to form a fuel stringer. While it might be thought that once the stringer has been inserted it would not be moved until it was exhausted, this is not the case, and stringers are regularly moved within the reactor in order to maintain a constant temperature across the reactor vessel. In order to achieve this operating condition some rods are moved every 4-6 weeks, The reactor produces steam to drive the turbines, at 600^0C and at a pressure of 150 bar.

In contrast, the Turbine Hall is conventional in layout and design. It is the same technology as would be found in a coal fired power station. Nonetheless it is an impressive structure and contains high, medium and low pressure turbines. The cooling water is drawn from the sea, and takes 7 minutes to pass through the plant before being discharged back into the sea at a temperature some 10^0C higher than when it entered the plant. Unfortunately the idea of some of our party to start fish farming in the effluent stream, possibly with the idea of producing precooked prawns, were thwarted when it was pointed out that the sea water is not only screened but also dosed with chemicals to prevent fouling of the pipework. While the chemicals are harmless when dispersed into the sea, fish farming is forbidden.

When EDF took over responsibility for running the UK's nuclear power stations in 2009, they had no experience of AGR stations since France had opted for Pressurised Water Reactors. They have now acquired a great deal of expertise in the AGR technology and staff exchanges are made between France and the UK. Unfortunately AGR was not successful in terms of worldwide sales and the UK's next generation of nuclear power stations will not utilise the AGR technology. Nonetheless the visit to Hunterston B was a great success and a real privilege. The initiative of EDF must be applauded in their decision to reinstate visits to demonstrate the safety, security and most impressive technology that can be deployed to produce large quantities of carbon neutral power.

John Banyard

Cultural Tour of Glasgow Friday 19th September

The first part of the morning comprised a short coach trip to visit the Cathedral and Necropolis with the choice of either a guided tour of one of the attractions or a self guided tour of both before the party rejoined to visit Kelvingrove Art Gallery and Museum.

Linda Brooks writes about the part of the visit which included the Necropolis visit:
Our guide joined us on our coach and was soon into her stride. We passed George Square with a statue of young Queen Victoria on a horse and also James Watt at one corner. We also saw several Saltires left over from the excitement of the referendum voting the day before. The sight of the grand Victorian building which is the Town Hall showed the prosperity of Glasgow in the early 20th Century when the population numbered over 1 million, compared to only 600,000 today. Instead of ship building, the city is now a conference and education centre.

The Necropolis and Kelvingrove Art Gallery and Museum

So we reached the Necropolis, the City of the Dead, which is adjacent to the Cathedral. Here we met our new guide, Annette Mullen, the sweetie lady. We were all invited to help ourselves to sweets before we set off. The land was bought by the Merchants House in 1650 and was then known as the Fir Park. The first interment was in 1832 – a time of grave robbers, when it was important to find a safe burial plot.

We stopped by the memorial to Archibald McLellan and heard his story, only to find he is buried in the Cathedral. Next was William Miller 1810-1872, the author of Wee Willie Winkie. Again this was just a memorial. We were then challenged to recite the words of the first verse of the rhyme and were all awarded a sweet when we completed it.

We were introduced to the symbolism of the grave markers such as an upturned torch which is the promise of resurrection and an urn half draped is the sign of a life not fully lived; there were many of these.

We looked over the Jewish section and stopped by the graves of Gorinda Lee, the gypsy queen and nearby 3 firemen who perished fighting fires, with information about each. This was a very interesting visit but we did not have time to hear all the stories from out enthusiastic guide or get to the top of the Necropolis and see the marvellous views.

Our next stop was the Kelvingrove Art Gallery and Museum which is housed in a splendid red sandstone building. It first opened in 1901 and was refurbished in 2006. Having fortified myself with a coffee, my first visit was to the Spitfire on the ground floor which was suspended over a display of elephants plus a giraffe and an ostrich.

My attention was then attracted to a display of swords and daggers. There were display boards at child height to tell what each was, including some very gory pictures, and also in the case were several figures made of looped stainless steel, each demonstrating how a particular sword was used. These ranged from the medieval knight to a Japanese samurai.

Next to this was a display of helmets along with animals that led to a particular design such as a lobster giving rise to a 'tail' at the back of the helmet to protect the neck.

My eye was also caught by a lovely silver galleon on wheels which was a prize given to Thomas Lipton for winning a yacht race. Many other interesting exhibits were seen, especially as, even with the floor plan as a guide, my sense of direction was failing.

On the first floor were most of the pictures with Salvadore Dali's Christ of St John of the Cross being in a small room on its own. It was interesting to see the change from almost photographic images such as Jan van Hugsom's Flowers in a Terracotta Urn, 1729 and the detail in Flowers and Butterflies by a Tree Trunk by Rachel Ruysch, 1683 to the more impressionist paintings of later years. Having seen the Scottish Colourists and then moved on to French Artists such as Van Gogh, Monet, Cezanne and many more, I was pleased to see Poor Faurette by Julien Bastien Lepuye 1881 also showing great detail in his painting. There were pictures to please all tastes.

We were able to stay on an extra 5 minutes past our 1 o'clock deadline so that we could listen to the start of the organ recital which sounded magnificent in that large space and then hurriedly left after the first tune to board the coach and join the rest of the party for lunch.

Glasgow Cathedral

Daniel Fayolle completes the report with his account of the visit to the Cathedral:

On Friday morning most engineers opted to visit Hunterston B nuclear power plant. But I decided that this would be like a busman's holiday for someone like me, who has been working in the power sector for the whole of his professional life. And, together with a few other engineers, I decided to join most of the ladies and go on the cultural visit, more specifically on the Glasgow cathedral guided tour. A real delight with a wonderfully knowledgeable guide, for a one-hour presentation.

This cathedral was erected in the 13th century on the very site of the first chapel built by Saint Mungo (patron of Glasgow city and a bishop of Strathclyde) during the 6th century. We were told it's the only cathedral, with that of Orkney, to have been spared demolition during the Scottish

Reformation, as it was protected by the Glasgow inhabitants and adapted itself to Protestant worship.

According to legend, Mungo had placed the body of a holy man named Fergus, on a cart pulled by two wild bulls telling them to take it to the place chosen by God. And in the place where the bull stopped he built his chapel.

We were delighted to see this cathedral in extremely good conservation condition, with a great unity of style, in spite of the different construction phases, and to listen to our excellent guide. The stained glass, as can be seen on one of the photographs, is of excellent quality and of great historical interest. Just as the decorative tiling on the floor and the old historical Bible book in a cabinet. Saint Mungo's tomb is, of course, there in a vast crypt, although our guide mentioned this cannot be referred to as a crypt because it is not entirely underground. I must admit one hour was a bit short for such a visit.

The Tall Ship 'Glenlee' and the Riverside Museum Friday 19th September

After the Friday morning visits the two groups met to have lunch on the 19th century sailing ship 'Glenlee' which is moored on the river Clyde opposite to the 'Riverside Museum'.

The 'Glenlee' is a most spectacular tall ship with enormous masts of large diameter stretching skywards. It was built in 1896 by Roger and Company at Port Glasgow and served with the Spanish navy from 1922 to 1992 as the 'Galatea'. It was renamed the 'Glenlee' on 6 July 1993 on its return to the Clyde. It served as a Cargo ship, a Training ship and now as a Museum ship and at one stage had a crew of 17 Officers, 30 Petty officers and 260 Ratings.

An excellent lunch was provided for the 86 visitors from the Worshipful Company of Engineers and we were seated at tables for 10 arranged in the dining area on the lower deck. After lunch there was time to look around this interesting ship and wonder at the skill and nerve that the sailors had climbing up the rope ladders to the top of the huge masts, a task that must have been quite frightening in rough seas.

Leaving the 'Glenlee' we then walked a few yards to the 'Riverside Museum' and were able to look around in our own time and enjoy the very varied and interesting items on display. This is an incredible museum spread over two floors and the architecture gives a feeling of light and space. There are vintage cars, steam locomotives (including some from the Apartheid era from South Africa), buses, trains and bicycles (including the world's oldest bicycle). One of the interesting features was the 'Arnold Clark Car Wall' which had 31 vintage cars displayed over three long platforms built one above the other on one of the walls. It was a great pleasure to your scribes to see that one of the cars was a 1952 Triumph Mayflower, the very first car that we ever owned.

All too soon it was time to board the coaches and return to our hotel, but this fascinating museum with over 3000 objects on display is certainly a

place that visitors to Glasgow would enjoy as all the exhibits are well displayed and documented.

Pam and Denis Filer

The Burrell Collection
Friday 19th September

With the result of the Scottish Referendum announced that morning, it was a fitting tribute for the Engineers and friends to visit the Burrell collection in Glasgow where we were reminded of the enormous contribution of the Scots to the British Empire. The collection consists of 9000 pieces of art, sculptures, tapestries, furniture and other artefacts collected from all over the Empire by Glaswegian shipping magnate, William Burrell, in the early years of the last century. The collection is so vast that not all items are on display at any one time.

In our short tour, we learned that, Burrell, being a canny Scot, made his fortune by buying ships when the economy was down and selling them when the economy recovered. Every piece of his collection was entered into a ledger with the price paid: there are even pieces listed that he did not buy with annotations such as "not paying that".

Our informative guide, Claire McLeod, gave us a flavour of the variety of items by showing us paintings by Bellini and Boudin and telling us you know it is a Boudin if you "can feel the breeze". Another interesting item was a woven French tapestry from the 15th century depicting peasants hunting rabbits with ferrets: our guide pointed out the humour in the tapestry such as the huntsman's breeches caught on a thorn to the amusement of a watching girl. The tapestry even uses engineering principles because the thickest threads run sideways so that the tapestry does not warp.

Burrell housed his collection at his home in Hutton Castle and there is a reproduction of one of the rooms at the Museum. The electric lights were really dim just as they were in Burrell's day - to save money! When he died, he gifted the collection to the people of Glasgow with the provisos that the collection must stay in Glasgow and be housed in a dedicated building outside the centre (away from the pollution). This was a difficult order and it took from 1944 when he died until 1970 for the purpose built award winning museum to be built in Pollock Park on the south side of Glasgow.

It is an impressive display and we enjoyed the human stories that were told on our tour which made it so much more than a stuffy museum! To do this collection justice, it is well worth a full tour.

Suzanne Flynn

Benmore Botanical Gardens, Loch Fyne Restaurant and Oyster Bar
Saturday 20th September

Saturday morning we were all up bright and early to catch the coaches which left at 8am. It was wet and there was a heavy shower on the way to Gourock to catch the ferry to Dunoon in Argyll but from then on the weather improved to give a beautiful day! From Dunoon we drove up past Holy Loch, where the American Navy Submarine Supply Ship was based for 40 years, to reach the Benmore Botanical Garden which is an offshoot of the Royal Botanic Gardens of Edinburgh.

The mountain sides of Benmore had been cleared of trees for sheep farming in the 18th century. In the 1820s the estate was purchased by the first of a series of owners who were interested in developing what was in effect an arboretum.

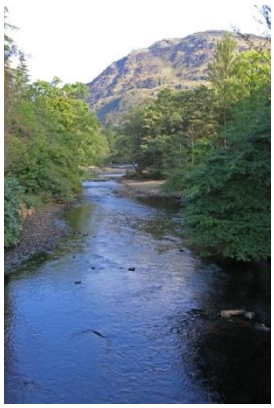
Land owners were sending out plant collectors to gather seeds and plants from all over the world and the mild climate of Argyll together with the large estate with its several valleys provided a canvas for a substantial arboretum developed over a hundred years or so and in fact still developing.

We walked from the coaches into an entrance surrounded by the fragrant

smells of Polygonum bushes and the beauty of Euchyphia trees in flower.

After a short introductory talk, we split up into various groups who wandered off to explore, some indeed having their coffee first! Shirley and I live in Sussex where we have a number of gardens developed at a similar time but whereas they have specimens of most of the trees seen at Benmore, at Benmore the planting is on a much larger scale.

There is for example an avenue of Coastal Redwoods with at least thirty or forty trees! There is a "Tasmanian Ridge", a "Butananese Glade", a "Chilean Rain Forest" and a "Japanese Valley". We were spoiled for choice and no one group could see everything!



Everyone found time for coffee at some time, and we came away overwhelmed by all we had seen; all this in beautiful weather. Back on the coaches we drove beside Loch Fyne for our lunch at the original Loch Fyne Restaurant. A two course meal commencing with what we were told by our friends was "Cullen Skink" which was listed on the menu as smoked haddock and potato chowder! The main course was poached salmon with chick peas and chorizo, all this with a glass of wine and coffee to follow, and so back to the coaches!

Shirley and Cecil French

Inveraray Castle
Saturday 20th September

If you have been on a package tour of any kind you will know that on reaching any port or town, if there is a church or castle nearby, you will be organised to visit it! Sometimes the edifice turns out not to be worth the effort but on this occasion we were in for a treat when we visited Inverary Castle.

There is a comprehensive web site www.inverary-castle.com which gives an excellent description and history of the castle and the Campbells, so I will just mention a few snippets picked up on the way round.

The castle is about sixty miles from Glasgow and built during a time of great prosperity in a mixture of Baroque, Palladian and Gothic styles. It is a 'statement' building rather than a fortified castle.

We were greeted by our guides at the entrance, known by the inhabitants as Paddington Station! With its wrought iron metalwork and corridor-like design, it was easy to see why. Our guides all wore a kilt and as a mere Sassenach I had assumed that they would all be clad in the Campbell tartan. Oh dear! I was soon put in my place by our guide who indignantly told me that he was wearing his own clan tartan.

Inverary Castle is the headquarters of the Clan Campbell and in my ignorance it took me a while

to twig that Dukes of Argyll were all Campbells. Incidentally there are about forty clans associated with Argyll and the Isles, with the Campbells being one of the largest. The Duke holds many hereditary titles and offices including Master of the Royal Household in Scotland and Admiral of the Western Isles.

On the tour of the castle we heard about brothers 'naughty' George and 'lovely' John. George unfortunately did not produce an heir to the dukedom although he was credited with siring at least twenty-seven offspring! One of the many portraits featured a Duke wearing clothing with no tartan, a recognition of the period in Scottish history when the tartan, kilt and bagpipes (mercifully) were banned. Later they were reinstated by George IVth. A portrait of the Countess of Coventry showed her with pale skin and rosy cheeks. She died at only twenty seven due to the high lead content of make-up at the time.

Military mementos were everywhere although I was disappointed to learn that the vast array of weaponry on the walls in the great hall were mostly just for decoration and had not seen a battlefield. Dukes over the ages had served in a variety of regiments although I had assumed that there would have been family loyalty to just one. Later Dukes had the surprising skill of being experts at elephant polo!

After the tour, led by very knowledgeable and interesting guides, we were left to wander on our own around the castle and its gardens. This proved to be too much for some of our members who, worn out from climbing the castle stairs and barely recovered from the plentiful and excellent wine and food at Loch Fyne, settled down to tea and cakes in the café. On second thoughts, maybe they were the wise ones taking it easy in preparation for the evening's ceilidh!

Hugh Vinson

Burns-style Supper and Scottish Country dancing, The Megalithic Suite, Saturday 20th September

Great chieftain o the puddin'-race!
Aboon them a' ye tak your place,
Painch, tripe, or thairm:
Weel are ye worthy o' a grace
As lang's my arm.

What an evening!

We could not have come to Glasgow at the invitation of our very Scottish Master, John Baxter, without some acknowledgement of both Robbie Burns and the Scottish national dish, but none of us was ready for the rich experience that actually happened.

At John's special request, we all wore 'something tartan' - more or less. The ladies looked splendid in their tartan dresses and skirts; the Scots in our midst were nobly attired in kilts and sporrans; others had found a ribbon or bow tie off the internet; and some men wore shirts in loud checks that might have been more suitable on lumberjacks!

However, we all had tried, and we entered into the spirit of the evening as we followed a piper into the dining room.

After escorting us to our seats, the piper then disappeared to return leading in the ceremonial haggis on a silver platter ready for the traditional address given by Gordon Masterson. Personally, I felt a slight sense of foreboding. My previous experience with a haggis had been in a student flat in London and the soggy mixture had upset my digestion for days afterwards; perhaps the problem could have been the cheap whisky!

But mark the Rustic, haggis-fed,
The trembling earth resounds his tread,
Clap in his ample fist a blade,
He'll make it whistle;
And legs, and arms, and heads will cut off
Like the heads of thistles.

This sense of foreboding has now been replaced with a feeling of sorrow for the poor animal.

(Anyone wishing to learn more of its situation in life should go to www.robertburns.org.uk/Assets/Documents/haggisarticle.pdf)
The full Address and English translation can be seen on Page 46.

The spirited and gleeful way in which Gordon Masterton delivered the Burns Conversation, splitting the entrails of the haggis with a dagger at the appropriate moment, made me think that I should treat the man with more respect and circumspection in the future. The ceremony over, we tucked into the haggis as part of our first course. It was quite delightful – warm, steaming and rich – as it should be. The rest of the meal was excellent. The Haggis, neeps and tatties were followed by sirloin of beef and then by lemon and raspberry pavlova – all mouth wateringly good.

A pause followed for the conclusion of the fundraising activities, expertly organised by Richard and Janet Groome. In all, the sweepstake on the outcome of the referendum, the silent auction and the raffle raised over £2000. This was a record for these events and a great credit to Richard and Janet.

The mood and tempo changed as we moved onto the Ceilidh. Four bearded, kilted and almost villainous looking (but actually charming) Glaswegian musicians strode into the hall and took up residence on the stage. The caller, Tom, had no time for shrinking violets and wall flowers, and we were all soon strutting our stuff to the Gay Gordons, Virginia Reel, St Bernard's Waltz (twice), Canadian Barn Dance, Strip the Willow, the Wild Rover, and the Flying Scotsman.

The memorable evening finished at midnight with Auld Lang Syne. I had not danced, or indeed enjoyed myself, so much for years.

Graham Owens

ELECTION OF THE LORD MAYOR
29th September 2014

My day started by taking an early train from Preston, Lancashire, at the crack of dawn; I must not be late for the election as this is not any ordinary election: this is the election of the Lord Mayor of the City of London! Having not participated in the Lord Mayor's election before, I could only imagine what it would be like but tried to keep my expectations low.

Thankfully, my train arrived in Euston on time. After battling the hustle and bustle of the City's busy underground I reached the Guild Church of St. Lawrence Jewry just after 10:30, just in time to

witness the most colourful procession of the City's "Best" as they entered the Church and took their places for the service to begin. As is customary, the Divine Service started with the National Anthem. The service was led by the Lord Mayor's Chaplains with a splendid compilation of hymns and prayers, specifically written for the Lord Mayor, the City, its Liveries and its Servants, and wonderfully complimented by the Organist Catherine Ennis.

The Lord Mayor, Aldermen, Sheriffs and Officers returned in procession from the Church to the Aldermen's Court Room. The Masters, Prime Wardens and Upper Bailiff, followed by the Livery Committee then returned to the Guild Hall to take their seats on the Hustings and the front rows below the Hustings. The Liverymen that got there in good time are also seated further back in the Common Hall. For the 'late' ones or the 'first timers', like myself, that took their time to either have a chat on the way or simply admire the stupendous architecture of Guildhall, there was another Grand Hall with imposing high ceiling and skilfully sculptured high columns and arches, located just underneath the Common Hall, the 'overflow' room as I called it, where there were still some seats available. Luckily, I managed to find a seat in between a lady Liveryman from the Builders Merchants and, coincidently, our very own Senior Warden, Patrick O'Reilly. A sigh of relief, I am in good company!

This year, there were three nominations for the position of The 687th Lord Mayor: Alderman and Fishmonger, Alan Colin Drake Yarrow, Alderman and Shipwright, Jeffrey Evans, and Alderman and Marketor, Sir Paul Judge. We, the Liverymen in the 'overflow' room, watched on a massive screen live, the pre- and post-ceremonial proceedings acted by the City's Sheriffs, Marshal, Swordbearer and other City Officers, all happening in real life in the Common Hall located just above us. Shivers came up my spine at the thought that this exact ceremony has probably not changed since the 13th Century when the title "Lord Mayor" was first granted to Thomas Legge (then serving his second of two terms) by King Edward III – with a slightly different audience!

The actual election was by raising our hands. Then a ceremonial departure of Senior Officers, all clothed in their colourful and carefully decorated robes, from the Common Hall, meetings behind closed doors (in the Print Room) and then back to the Common Hall to announce the election result. The Recorder delivers the jubilant announcement: Alderman and Fishmonger, Alan Colin Drake Yarrow, will be The 687th Lord Mayor of the City of London!

The atmosphere is a joyous one. The Lord Mayor is now elected and he delivers his first speech; his theme for his year in office will be six words: "creating wealth, giving time and supporting". His speech is followed by the outgoing Lord Mayor Alderman Fiona Woolf CBE, the New Sheriffs and Masters; all speeches of appreciation and thankfulness. The Common Hall is then dissolved by the Common Cryer and Serjeant-at-Arms concluding by saying 'God Save the Queen' and all Liverymen enthusiastically responded 'God Save the Queen'!

All Liverymen then made our way out of the Guildhall, letting the procession of all Senior Clothed Officers led by The Lord Mayor and The Lord Mayor Elect go first, also joined by their close family members posing flamboyant head decorations of Feltmakers' best!

Together with my fellow Engineer Liverymen who also participated in the election we took the streets through the City's narrow alleys and made our way to the Founders' Hall, where we were kindly hosted to a scrumptious hot luncheon. A perfect ending to a magnificent day, full of colour and pride; a 'must attend' date for every Liveryman's annual calendar! Having now been part of the actual day, I can definitely say that it exceeded all my expectations indeed, and I am looking forward to the next year's elections already – a very pleasant thought to ponder over

as I reminisced on my long train journey back North.

Yuli Doulala-Rigby

LADIES' LUNCHEON TALLOW CHANDLERS' HALL 7th October 2014

Before the Ladies' Lunch at Tallow Chandlers' Hall on 7 October, we were offered the opportunity to visit St Paul's to see some of the exhibits on display to commemorate World War I.

Ruth Cousins has been involved with a project at the Cathedral to restore an altar cloth which had been embroidered by seriously injured solders from several commonwealth countries during the Great War *(See related article on Page 44).*

Our guide, Jane Robinson, is the researcher on the project. She explained that a book listing the embroiderers and their countries of origin had been created and that she is now using this record to trace their descendants. Jane has been successful with some British and Australian families but unfortunately the New Zealand pages were blank and it is assumed that the book was created after they had returned home. A collection of beautiful flowers and birds with a jewelled chalice at its centre, the embroidery is outstanding

Ruth explained how each element had been embroidered separately by convalescent soldiers in different parts of the country and then appliquéd on to the damask backing. Ruth's conservation group has been involved in strengthening the damask with invisible net and she had sourced and replaced the stones missing from the chalice. The cloth will be on display in St Paul's until 2018 and might then be displayed in the Imperial War Museum.

In contrast, Gill Scahill then showed us the sculptures by Gerry Judah of two massive white crosses covered in models of bombed buildings (based on Lebanon and other areas of conflict) which depict the horror of war. Although seemingly out of place among the great beauty of the cathedral, the sculptures do make the viewer stop and contemplate the devastation created by war.

On a happier note, Gill showed us the beautiful mosaics created in the cathedral after Queen Victoria had complained that it was too simply decorated. Many of the mosaics were paid for by the more ancient livery companies such as the Mercers and the Grocers.

There was then just time to view William Holman Hunt's Light of the World before departing for a delicious lunch.

Christine O'Reilly

The ladies visiting the embroidery tour at St Paul's Cathedral were joined by others travelling from farther afield, for the Ladies' Lunch at the Tallow Chandlers' Hall in Dowgate Hill at midday, making the party up to 45 ladies for lunch.

We were greeted by the Clerk, Brig David Homer, who gave us a tour of the hall and a talk on the history of the Tallow Chandlers' Company. It is one of the smaller of the London Livery Halls but

is still amongst the oldest and most beautiful. King Edward IV granted the Company livery status in 1462, and they built their first hall on their present site in Dowgate in 1476. The hall was burnt down in the Great Fire of London in 1666, it was rebuilt in 1672 on the same site, and this is the hall we visited. The Tallow Chandlers are noted for their impressive collection of paintings adorning their walls, and the Clerk enthusiastically explained their backgrounds to us.

We moved to the Banqueting Hall for lunch, where we dined regally on goat's cheese salad, followed by griddled salmon. During the dessert of crème brûlée, the Master's Lady thanked the

Tallow Chandlers for their fine hospitality and for the wonderful lunch served in such beautiful surroundings.

Margaret then introduced Mrs Helena Varma - Director of RedR UK, who gave an inspiring talk on the origins of RedR and its founder Peter Guthrie. She talked about the scope and scale of their work today and their focus on their role in training in the provision of survival and lifesaving skills, and of their humanitarian charity. This year has been a particularly busy year, with more than 8000 workers trained in these skills in 84 countries. They have, with others, provided support in disaster relief in the major earthquakes earlier this year.

The vote of thanks was given by Christine O'Reilly, the Senior Warden's lady who thanked Helen for her interesting, thought-provoking and inspiring presentation, and wished RedR every success in its further endeavours.

The ladies left this delightful hall at 3 pm with the good wishes of the Clerk still fresh in their minds as they embarked on their next task for the afternoon - some retail therapy, before taking the journey home after an excellent day.

Janet Williams

COMPANY NEWS
July Court Meeting

Welcome to seven New Liverymen clothed at the Court Meeting on 15th July 2014

Owen Price is Engineering and Product Development Group Leader at AWE in which he has spent most of his career to date, working on aqueous waste management, nuclear arms technical transparency, treaty verification and non-proliferation policy.

Owen's principal interests are: non-proliferation; arms control verification; systems engineering; technology demonstrators; small batch production realisation.

Owen is a Fellow of the I Chem E.

Steven Jones is Vice President of Thermal Services North Europe, Alstom Power and is responsible for service activities within the Baltics, Sweden, Denmark, Finland, Iceland, Ireland, Norway, and the UK. Additionally, Steven holds the position of MD of Alstom's Thermal Services business in the UK, which has been the case since early 2002.

Having completed a five-year apprenticeship and university degree in engineering, Steven worked predominantly on project management and project

execution activities in a number of different industries including oil, gas, chemicals and power, in the Middle East and the UK. Steven moved into business management in the 1990s, leading a number of business units in companies such as Mowlem, Rolls Royce, ABB and Alstom.

In addition to his engineering degree, Steven has an MSc in Construction Law, is a Chartered Director and a Fellow of the Institute of Directors. This complements his status as a Fellow of the Institution of Mechanical Engineers and a Chartered Engineer.

Personal interests for Steven are varied; he is a skilled and ambitious cook and has a passion for culinary arts. He is fully adept in property development and totally re-built and doubled the size of his family home.

Judith Hackitt CBE FREng is a chemical engineer who graduated from Imperial College London in 1975. Judith's career includes more than 20 years in chemicals manufacturing operations management, followed by several years heading up the Chemical Industries Association trade body representing the whole of UK manufacturing industry to Government at home and at EU level in Brussels.

Judith was appointed to her current role as Chair of the Health and Safety Executive in October 2007. She is also senior independent non-Exec Director of the Energy Saving Trust and a non-Exec Board member of the High Value Manufacturing Catapult.

Judith is a fellow of the Institution of Chemical Engineers and served as President from 2013-14. She was elected a fellow of the Royal Academy of Engineering in 2010 and was awarded her CBE for services to health and safety in 2006. Judith regularly gives talks to audiences of young potential aspiring engineers and is keen to encourage as many young women as possible to enter the engineering profession.

She is married to David who is also a chemical engineer (they met at University) and has 2 grown up daughters.

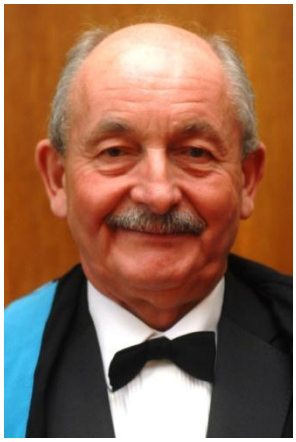
Eur Ing Peter James Walsh is Chief Executive of the Society of Operations Engineers having earlier experience in Australia in energy management and power generation, interspersed with practice as a solicitor, before moving to UK in a minerals engineering role.

Peter's principal interests are Mineral processing, power generation, safety & compliance, facilities management; mentoring and development of engineers and engineering technicians; international mobility of engineers.

Peter is a Fellow of the I E Australia and, of course, The Society of Operations Engineers.

Dr John Bridgeman is Professor of Environmental Engineering and Director of Research and Knowledge Transfer in the College of Engineering and Physical Sciences at the University of Birmingham, with responsibility for the development and delivery of a robust and effective College research and knowledge exchange strategy, encapsulating the work of the nine constituent Schools. He joined the academic staff at the University in 2005 following a 15 year career in the water industry working on planning, feasibility and detailed process and hydraulic design of water and wastewater treatment systems. Since then he has been actively involved in all aspects of academia including research, technology transfer and teaching, and has developed an international profile for his contributions to research in water management and, in particular, the areas of numerical modelling and water quality assessment.

John is a Chartered Civil Engineer and a Chartered Scientist, and a Fellow of the Institution of Civil Engineers and also of the Chartered Institution of Water and Environmental Management. He is a Vice Chair of the ICE's Expert Water Panel, Secretary of the International Water Association Specialist Group on Design Operation and Maintenance of Drinking Water Treatment Plants, and a Committee Member of the IWA Specialist Group on Disinfection.



Nick Hill BSc, CEng, FICE graduated in Civil Engineering at the University of Salford. He began his career with Sir William Halcrow and Partners before moving to John Brown Engineers and Constructors, latterly CB&I and has spent all of his 37 year working life in London.

His career has been almost entirely in the energy sector. Initially he was involved in the design of offshore platforms in the North Sea before progressing to project and construction management of onshore gas and LNG regasification terminals.

Prior to becoming Project Director for CB&I's EPC Contracts at National Grid's Isle of Grain LNG Terminal, Nick was Director of Contract Development for CB&I's Europe, Africa and Middle East region.

In 2004 he chaired the the Steering Committee for the Institution of Civil Engineers e-mail forum on Offshore Wind Farms.

Nick has a strong interest in the practical training of young engineers and hosts a monthly visit of office based graduate engineers at the construction site.

Gina Barney left school at 16 and undertook a five year apprenticeship in electronics at EMI Engineering Development, Hayes. Completing an ONC and HNC in four years, she then read electrical engineering at Kings College, Durham University and was awarded successively a BSc (1959) and an MSc by research (1962). Gina was awarded a PhD (1965) at Birmingham University for her work on the 1Gev Proton Synchrotron, where she designed a four quadrant drive. She then joined the University of Manchester Institute of Science and Technology to work on hybrid simulation and time sharing computing. At Manchester University she was appointed Director of Networking in 1985 installing fibre optics across three campuses. Her lifelong research interest became vertical transportation (lifts, escalators, etc.). A recognised worldwide expert on traffic design and control she is a senior member of many BSI committees, serving as the UK expert on various ISO committees. She runs a consultancy providing industry wide advice and acts as a single and party appointed expert to courts. A prolific author she has written over 20 books and 100 papers. To relax, she goes Scottish and ballroom dancing, walks her two dogs and gardens, besides redeveloping her local village hall.

MEMBERS' NEWS

It is with sadness that we report the death of John Richardson who died in September 2014 at the age of 85 years who was clothed in April 1986 and of Phil Ramsell who died in the same month, who was clothed in July 2004.

They will be sadly missed by those who were fortunate enough to know them.

The following Obituary is courtesy of Lynn Postle FICME, the Editor of the Foundry Trade Journal.

Dr Phil Ramsell CEng FICME
1937-2014

Phil died suddenly at home in September. He will be remembered throughout the cast metals industry as an expert in non-ferrous melting applications.

Much of his work with the industry has been with furnaces, initially specialising in heat treatment and subsequently for melting non-ferrous metals with both electricity and gas.

Phil began his working life at George Ellison Ltd in Birmingham as an engineering trainee in 1953 before moving to International Furnace Equipment ltd in Aldridge as a trainee draughtsman in 1956.

Having joined Fuel Furnaces Ltd in Great Barr in Birmingham in 1959 as a trainee technical representative, Phil worked his way up to head of sales and service development, before being appointed to the board of directors in 1963. He was managing director from 1969 to 1975.

During the 1970s, he pioneered the use of electric resistance furnace technology – particularly for aluminium. At that time he developed a relationship with Naber Industieofenbau in Germany which resulted in the setting up of Ramsell-Naber Ltd in the UK in 1975 to design and promote the use of electric resistance furnaces.

Since that time the company has gone from strength to strength and Phil's enthusiasm along with that of his wife Jane has helped Ramsell Naber develop an international reputation for high quality equipment and products. Throughout the years the company has formed allegiances with various international suppliers and represents them in the UK, including: LAC® gas and electric crucible-type furnaces, a range of ZPF-Therm's aluminium melting furnaces, large holding and alloying furnaces, chip melters and charge pre-heaters, Krown dosing furnaces, NOLTINA® brand crucibles, and Aluminium Martigny France melting fluxes and chemicals. The company is also the sole distributer in the UK and Ireland for Loramendi mould and core making machines, Colosio Srl high pressure diecasting machines and molten metal pumps from Molten Metal Equipment Innovations.

Phil's dedication to Ramsell Naber was matched by a determined commitment to everything he did. He was an enthusiastic supporter of lifelong learning; having originally gained a HNC in Mechanical Engineering in 1959 he completed a Post Graduate Diploma in Manufacturing: Management and Technology at The Open University in 1996 followed by a Master of Science Degree in the same subject in 1997. He went on to receive a PhD in March 2003.

He has given numerous technical presentations throughout the UK and around the world on a variety of topics such as energy efficiency, environmental impacts of manufacturing and developments in furnace technology.

His association with the Institute of Cast Metals Engineers began when he joined the then IBF as a Fellow in 1994. He has since given presentations to various branches and has had many articles on the subject of non-ferrous melting published in the Institute's journal and other publications. In September 2001 he became chairman of the ICME technical board and has been a regular supporter of the Institute's responsibility to disseminate high quality technical information to its members. He

became a Chartered Engineer (CEng) in 1998 and in the same year registered in FEANI as a European Engineer (EurIng). He received the prestigious *ICME Oliver Stubbs Medal* in 2006 for imparting knowledge to fellow institute members on the practice and theory of founding and was awarded the *ICME John Campbell Medal* in 2013 for a sustained contribution to the science and understanding of metal casting.

Through his association with the Worshipful Company of Engineers, Phil became a Freeman of the City of London in February 2004 progressing to Liveryman in July of the same year.

Throughout his life Phil was a keen angler, sailor, walker and cyclist and threw himself one hundred per cent into his hobbies during his rare spare time. One of his greatest achievements in this area was cycling from John O' Groats to Land's End in just nine days in 2010 - the 900-mile journey usually takes leisure cyclists two to three weeks. His efforts helped raise £25,000 for Macmillan Cancer Support. He still has many essays and writing projects on various topics awaiting publication.

Phil was a true gentleman and was always on hand to help the many organisations he was involved with and offer support and advice to colleagues and associates throughout the cast metals industry.

His enthusiastic approach to life is an example to us all. He will be sorely missed by his wife of 36 years Jane, their family, colleagues, friends and the ICME.

Blue Sapphire Wedding Anniversary

In July, Barbara and Denis Dickinson celebrated their 65th wedding. They met in1941 in Helston as evacuees from their school in West Ham. After friendships with various boy and girl friends, they finally married in Forest Gate in 1949. After living for 80 years in the suburbs of London, they moved to Norfolk and regularly visit their two daughters, five grandchildren and a great grandson; another is due in January. As nonagenarians, they now limit their visits to Company events to the Carol Service and Dinner but recall with pleasure many splendid OOT locations, particularly Budapest.

100th Anniversary of the outbreak of WWI

On Sunday, 3 August 2014 a Sung Eucharist was held at St Paul's Cathedral commemorating the 100th anniversary of the outbreak of World War I. At this service an altar frontal, made by recovering servicemen in rehabilitation hospitals and restored by the Cathedral Broderers, was displayed for the first time for over 70 years; (the altar for which it was designed was destroyed in a bombing raid in October 1940). Many relatives of the men involved were traced and some of them attended on that evening.

During the service, Past Master's Lady, Ruth Cousins (who had worked on the restoration of the frontal) represented the Broderers and read some of the prayers.

Chief Scientific Advisor Prof John Loughhead OBE FREng FTSE

On 2nd October 2014, The Department of Energy & Climate Change issued the following Press release regarding John Loughhead, one of our liverymen:

Professor John Loughhead OBE FREng FTSE has been appointed DECC's Chief Scientific Advisor, it has been announced today.

Professor Loughhead is currently Executive Director at UK Energy Research Centre

(UKERC) and will bring his extensive experience in energy industrial research to make sure the best science and engineering advice underpins Government energy and climate change policy.

Energy and Climate Change Secretary Ed Davey said:

"We are very fortunate to have Professor Loughhead join DECC as we deliver the greatest reform of the electricity market in a generation.

"New technology is the driving force that is moving us to a low carbon economy, powering new jobs and green growth. With vast engineering experience across academia and the private sector, Professor Loughhead brings a depth of knowledge that will be invaluable in areas such as shale gas, as well as keeping the UK as an energy world leader and creating momentum towards a global climate change deal."

Professor Loughhead has been active in energy research for more than 30 years, predominantly in industrial development for the electronics and electrical power industries. Before joining UKERC, John was Corporate Vice-President of Technology and Intellectual Property at Alstom's head office in Paris.

He has been a member of the EPSRC Council and of the European Advisory Group on Energy, is presently the UK-China Science Focal Point for Energy and Renewables, and a member of the European Energy Research Alliance Executive Committee.

Professor Loughhead said:

"I am both honoured and delighted to be appointed as Chief Scientific Advisor. DECC has a great reputation for accessing the best available science and engineering evidence and analysis. I look forward to helping further improve this, and supporting our Ministers and the rest of DECC in its insightful use to tackle the great challenges of energy and climate change."

A Chartered Engineer, Professor Loughhead graduated in Mechanical Engineering from Imperial College, London, where he also spent five years in computational fluid dynamics research. He is Past-President of the UK's Institution of Engineering and Technology, Fellow of both the UK and Australian national Academies of Engineering, Professor of Engineering at Cardiff University and Fellow of Queen Mary University of London.

Honours

Congratulations to Past Master John Robinson, Chairman of our Charitable Trust Fund who was made a Commander of the Order of the British Empire for services to Engineering and charity. .....and to Professor Isobel Pollock, Middle Warden, who was made an Officer of the Order of the British Empire for services to Engineering in HM The Queen's Birthday Honours list in June 2014.

From Young Member to Youngest President

On 28 May 2014, Group Captain Mark Hunt became the 129th President of the Institution of Mechanical Engineers (IMechE). Mark is the first Royal Air Force Officer to do so and the youngest President in the IMechE's 167-year history since Robert Stephenson in 1848, one year after his father, George, became the founding President. This is a continuing theme for Mark, having been elected the IMechE's youngest Fellow in 2004 and thereafter the Worshipful Company of Engineers' then youngest Liveryman in 2005.

Mark is currently the Type Airworthiness Authority for the Royal Air Force's Intelligence, Surveillance, Target Acquisition and Reconnaissance aircraft fleets at RAF Waddington. He has just been selected to be the next Commandant of the Defence College of Aeronautical Engineering and Station Commander

at RAF Cosford, home of Royal Air Force Engineering, where he will be the guardian of all technical training and inspire the Royal Air Force's next generation of engineers.

Other Congratulations!

Informed by chance conversations *ET* is pleased to relate that:

on 10th October 2014, Past Master Andrew Jackson and Christine celebrated their Golden Wedding;

on 28th October 2014, Steve the Beadle (and Assistant Clerk) celebrated his 60th Birthday;

and last but not least, Senior Warden Pat O'Reilly and Christine celebrate their Ruby Wedding on 16th November 2014.

Please let *ET* know of any special/personal announcements you would like to have included in future issues, with a photograph if possible, at: *d.scahill@btinternet.com*

Address to a Haggis

by Robert Burns

Great chieftain o the puddin'-race!
Aboon them a' ye tak your place,
Painch, tripe, or thairm:
Weel are ye worthy o' a grace
As lang's my arm.

The groaning trencher there ye fill,
Your hurdies like a distant hill,
Your pin wad help to mend a mill
In time o need,
While thro your pores the dews distil
Like amber bead.

His knife see rustic Labour dight,
An cut you up wi ready slight,
Trenching your gushing entrails bright,
Like onie ditch;
And then, O what a glorious sight,
Warm-reekin, rich!

Then, horn for horn, they stretch an strive:
Deil tak the hindmost, on they drive,
Till a' their weel-swall'd kytes belyve
Are bent like drums;
The auld Guidman, maist like to rive,
'Bethankit' hums.

Is there that owre his French ragout,
Or olio that wad staw a sow,
Or fricassee wad mak her spew
Wi perfect scunner,
Looks down wi sneering, scornfu view
On sic a dinner?

Poor devil! see him owre his trash,
As feckless as a wither'd rash,
His spindle shank a guid whip-lash,
His nieve a nit;
Thro bloody flood or field to dash,
O how unfit!

But mark the Rustic, haggis-fed,
The trembling earth resounds his tread,
Clap in his walie nieve a blade,
He'll make it whissle;
An legs an arms, an heads will sned,
Like taps o thrissle.

Ye Pow'rs, wha mak mankind your care,
And dish them out their bill o fare,
Auld Scotland wants nae skinking ware
That jaups in luggies:
But, if ye wish her gratefu prayer,
Gie her a Haggis

Address to a Haggis Translation

Great chieftain of the sausage race!
Above them all you take your place,
Stomach, tripe, or intestines:
Well are you worthy of a grace
As long as my arm.

The groaning trencher there you fill,
Your buttocks like a distant hill,
Your pin would help to mend a mill
In time of need,
While through your pores the dews distill
Like amber bead.

His knife see rustic Labour wipe,
And cut you up with ready slight,
Trenching your gushing entrails bright,
Like any ditch;
And then, O what a glorious sight,
Warm steaming, rich!

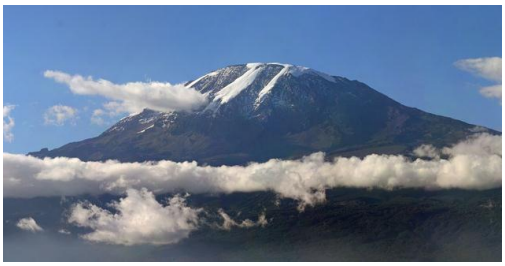
Then spoon for spoon, the stretch and strive:
Devil take the hindmost, on they drive,
Till all their well swollen bellies by-and-by
Are bent like drums;
Then old head of the table, most like to burst,
'The grace!' hums.

Is there that over his French ragout,
Or olio that would sicken a sow,
Or fricassee would make her vomit
With perfect disgust,
Looks down with sneering, scornful view
On such a dinner?

Poor devil! see him over his trash,
As feeble as a withered rush,
His thin legs a good whip-lash,
His fist a nut;
Through bloody flood or field to dash,
O how unfit.

But mark the Rustic, haggis-fed,
The trembling earth resounds his tread,
Clap in his ample fist a blade,
He'll make it whistle;
And legs, and arms, and heads will cut off
Like the heads of thistles.

You powers, who make mankind your care,
And dish them out their bill of fare,
Old Scotland wants no watery stuff,
That splashes in small wooden dishes;
But if you wish her grateful prayer,
Give her [Scotland] a Haggis!











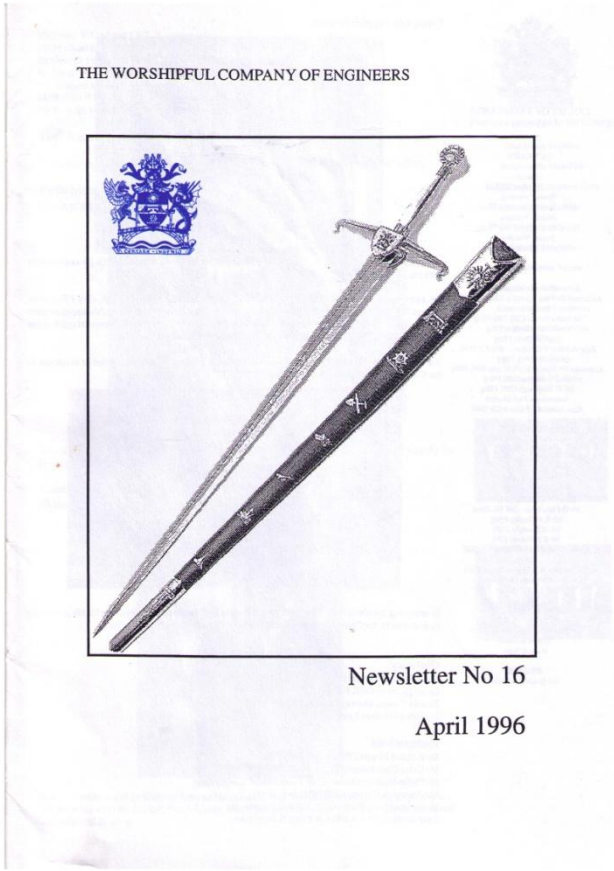




RedR – Kilimanjaro

In this issue of The Swordsman there is an article about the Master's and Margaret's climb of Kilimanjaro to raise funds for RedR. These photos are from a presentation prepared by BP Engineering to report its success. You may be aware that The Worshipful Company of Engineers' Charitable Trust Fund is a major sponsor of RedR and that it has been special in our Master's focus on "the charitable role of the Livery." The Engineers' Trust is delighted that Liverymen's donations added to the Trustees guaranteed donation resulted in £7000 being presented to RedR, whose Patron, HRH the Princess Royal, was clothed as a Liveryman by the Master at our Annual Banquet at Mansion House.

See the next issue!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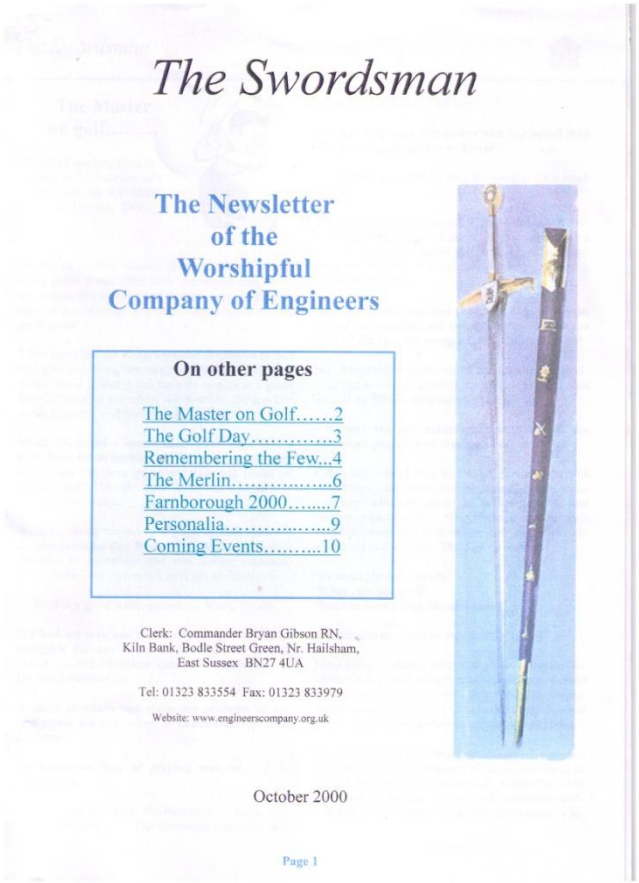
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The Newsletter of the Worshipful Company of Engineers

On other pages

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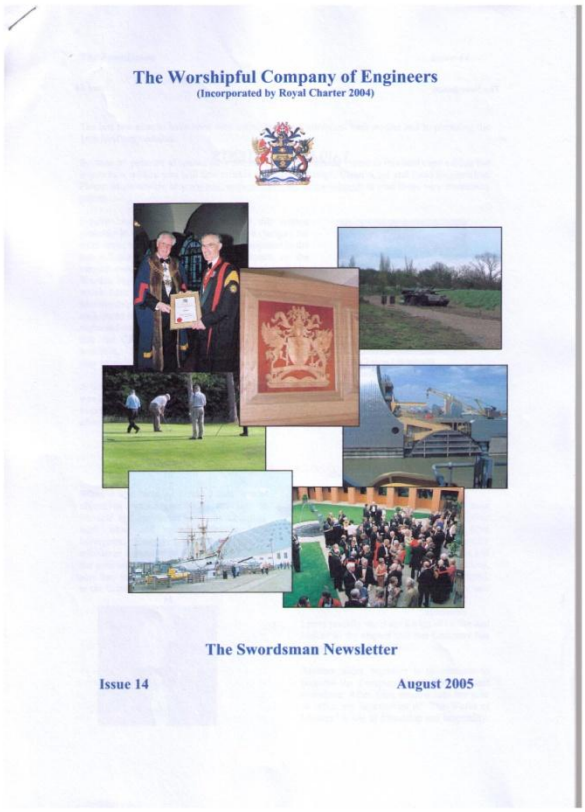
THROUGH THE AGES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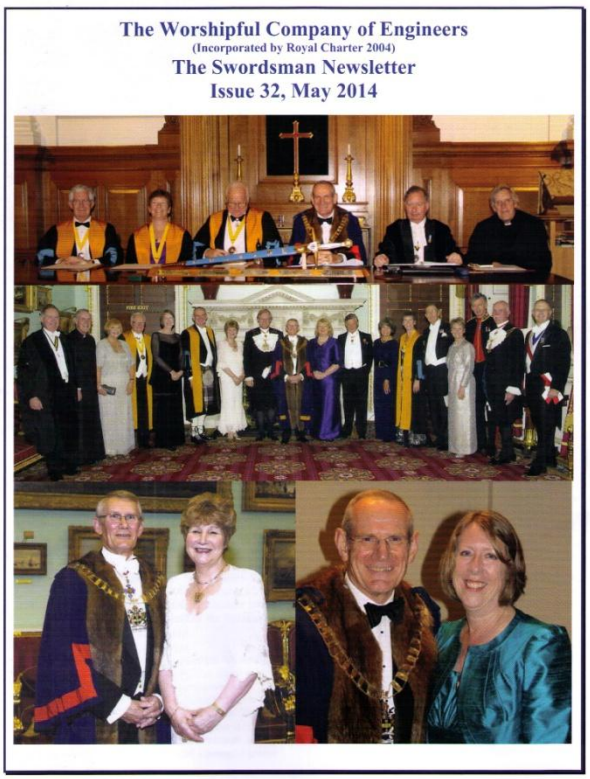
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