# The Worshipful Company of Engineers

**(Incorporated by Royal Charter 2004)**

# The Swordsman Newsletter

**Issue 22**

**August 2009**

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# EDITORIAL

I had promised to produce 3 editions a year rather than just two but with the Silver Swordsman in March (available only in the web site) things rather overtook me. So we now have a bumper edition with, I am pleased to say, a technical paper as well. I will be pleased to publish more papers from Liverymen if they wish and hope that the Hawley Award Winner's paper may be available for the next edition. Thank you once again to all the reporters for their contributions. If I have not asked you yet and you are going to a function and would like to act as the reporter do, please, let me know.

*Raymond Cousins*

# THE MASTER'S COLUMN

If this was a plinth, the question would be: "What to put on it?" But it's a column and still there are too many possibilities of what to put in it! Three months into my year as Master Engineer, there have been so many fascinating experiences of the City and of other Livery events. It really has been a privilege to represent our Company. I have decided to highlight just one thing, but before I do I must say how gratifying it is that our Company's events have been so very well supported since my installation at Common Hall on April 21st. Thank you so much for your support, and do keep coming to our events.

What I would like to highlight is developments in **RedR**, which I have become aware of at two events that I have been invited to as Master.

You will remember that the Worshipful Company of Engineers is a patron of RedR. The IMechE and ICE are also patrons, as are several construction and consulting engineering companies. It trains professionals, particularly engineers, to provide the right assistance after disasters and uses the banner ***helping rebuild lives in times of disaster***. While immediate relief in the form of provision of food and temporary shelter grabs the headlines in our newspapers and on TV, it is the restoration of roads, water supply, sanitation, bridges and permanent shelter that really makes the difference and that the RedR-trained volunteers make happen.

In nearly 30 years since it was formed, engineers from RedR have been deployed and worked in partnership with aid agencies and governments all over the world in the wake of one disaster or another. It is not only recognised for the quality of its training and its tremendously valuable handbook for disaster relief workers but has become a leading body globally.

Recently, the **UN** has set up a Cluster System to define how the world must respond to disasters, post the Tsunami. RedR is tasked by the UN to write technical guidelines on *Water, Sanitation and Hygiene* and to select global co-ordinators for these and train them. It has also been asked to provide training at regional and country level. **Shelter** has asked RedR to assess its technical skills globally and to *Train Trainers* for it. Within the UN Cluster system, RedR has now been asked to do similar work for the *Nutrition* and *Education* Clusters.

RedR is now providing in-country training, as well as the training it has traditionally given to professionals in UK. The in-country training concentrates on the basics, with Health and Safety featuring strongly, so that the value of their work is felt when there is no disaster to recover from as well as when there is. RedR is also working with student bodies and universities in UK to engage them and to get some of its expertise and caring global context into courses.

Meanwhile, RedR's patrons have been stepping up their support, often through employee involvement in fund-raising. This is particularly valuable as UK Government funding decreases. Our Company's patronage of RedR continues for 2 more years before review. Members may like to think whether the companies or universities that they work for could be directly involved with RedR, not just for the good it does with the donations it receives, but also for the benefit that young employees get through involvement with RedR.

All in all, we can be proud of our support for RedR. It is a charity that really is helping rebuild lives in times of disaster, and, with a renewed focus on engineering, is accepting the challenge to help other organisations meet the same valuable and caring objective.

*Chris Price, Master Engineer, July 2009*

# THE CLERK'S CORNER

Last April, at Skinners' Hall, I was privileged to be installed as a Court Assistant which in turn required me to resign my post as The Clerk but to be re-appointed as The Honorary Clerk until a replacement could take over from me. The formal process of recruitment has now taken place and it is expected that the Court of Assistants will install the selected Clerk Designate at their next meeting on 6th October 2009 for a hand-over period to begin before appointment as The Clerk on 1st January 2010.

By that time I will have served the Company as your clerk for 7 years – twice as long as any tour that I completed in the Royal Air Force. However, looking back I must say that it hasn't felt any time at all as I have learned something new and fascinating about Livery almost every day. Of course my predecessor, Past Master Bryan Gibson, would say it was because I was well-trained but in truth, his help, together with a great combination of experience and unstinting support from Stephen Grundy, our Beadle and Assistant Clerk, the various Masters I have served under including Past Master Cousins, now our Swordsman editor but also a former Clerk, and the 'soft' skills of my wife Margaret in every facet of Company life have made this 'part-time' appointment a 'full-time' rewarding experience.

I would like to think that the character of the Company has moved forward in the period that I have been in office. Such aspects as the consolidation into the Engineers' Office in Wax Chandlers' Hall has been a sound base to help improve the accounting arrangements, administration of the paperwork including the archives, service to members through the web-site and internet facilities, as well as providing a solid focal point in The City. With the Company itself one of the challenges 7 years ago was to reverse the reducing numbers of members and through the Membership Committee this has been achieved in several ways including the introduction of an interview route to membership for those without full sponsorship together with a 'mentoring to fellowship' route to Liveryman status for those Chartered Engineers who were still members of their professional engineering institutions. On the social side, after a rationalisation and more even spread of 'Our Livery Year' principally by the move of the 'Out-of-Town' meeting to September and decoupling the Awards Dinner from the Installation, the Programme Committee has been able to space a greater variety of events to be enjoyed not only by members but also to offer the opportunity for them to be joined more often by partners and guests. On top of these changes, it has been marvellous to see the Company grow with a Royal Charter in 2004 and to implement the consequential improvements in governance and transparency including greater emphasis on the Charitable Trust Fund arrangements. Of course, last year in 2008, there was the wonderful celebration of our first 25 years showing again how 'Engineers' punch well above their precedence in The City as elsewhere.

Overall, there is no doubt that I have very much enjoyed my experience as The Clerk – thank you all for your help, forbearance and support of all the efforts from the Engineers' Office in my time. I know that you will all give similar encouragement to my successor in due course. Finally, I will look forward to serving the Company in the future.

*Graham Skinner, Honorary Clerk, 2nd August 2009*

# SPRING OUTING TO A FLIGHT SIMULATOR 10 February 2009

On a bright Tuesday in February, a group, which included The Master, The Clerk, Liverymen and some ladies, assembled in the studio and workshops of Bill O'Riordan at his home in Warfield. Bill's long-standing colleagues, Ed Turner and John Panter, accompanied Bill. The three of them had been together with ICL for many years, and now retired they had continued to be practical engineers building things for interest and amusement.

Bill gave us a presentation about his passion for Flight Simulation. Bill is a remarkable man, who has built and flown airplanes and helicopters in the past. Engineering for him is rising to the intellectual challenge of an idea, and developing and building practical solutions.

Bill and his enthusiasm would clearly be a great role model for younger people of today. A lively

discussion followed his presentation on how we, more mature engineers, should go out to the young people, and show them what engineering is all about. We should not expect them to come to us.

*View from Cockpit in the Flight Simulator*

Bill then led us into his simulator room. And, low and behold, there in this house, Bill had built 2 working flight simulators, with the aid of Ed and John. One was a helicopter simulator complete with a set of controls. The other was a twin-engine fixed wing plane with twin-seated controls. Both had full instrumentation and visual systems so the pilots could see what was going on.

*The Clerk Piloting the Master*

Needless to say the engineers amongst the group were all keen to have a go and see how they could fly these aircraft. "Just take off from City airport and land at Heathrow "was the instruction from Bill to the crew of the twin plane. Some landed at Heathrow, but not on the runway, and maybe the wheels were not down. Others decided to try and land at Northolt, with mixed success.

Some men set out to prove Bill wrong when he told us that ladies were better at controlling the helicopter. But the ladies proved to be good at both machines. The helicopter could become very unstable in inexperienced hands; fortunately Bill used the usual computer technique to get us out of difficulty, namely switching the unit off and turning it on again.

It was a very relaxed and enjoyable occasion. Bill's wife provided an excellent buffet lunch with wine added to the pleasure of the day. Through Bill's personal generosity there was no charge for the outing so that all our money for the event went towards the Charitable Trust Fund. Our grateful thanks went to Bill, his wife, and colleagues for creating such a splendid day.

*Bill Bayly*

## ELECTION COURT MEETING, SERVICE AND DINNER 3 March 2009

At the Election Court Meeting Mr Chris Price OBE FREng was elected Master to take office on 21st April. Mr John Robinson FREng, Mr John Banyard OBE FREng and Mr David Scahill were elected as his Senior, Middle and Junior Wardens respectively. At the end of the Court Meeting three new Liverymen were invested and further details of these can be found in the Personalia section.

Everyone then processed to the Church of St Vedast alias Foster in Foster Lane to seek a blessing upon the Officers Elect. In the unavoidable absence of the Chaplain the Service was led by Past Master Richard Rooley who is also a Lay Reader.

*St Vedast Alias Foster*

In his sermon Richard suggested that, 'in the tradition of Biblical legend, the Tower of Babel had been constructed by a Tribe of Civil Engineers. Subtle differences in translation of biblical text conclude that God did not confuse language to punish, but created a Gate of God, or Babel Gate, of grasped opportunity. In analogy there was created the present Engineering Institutions including an Engineering Council, a Royal Academy and a Worshipful Company of Engineers to remind them of God's presence.

*Past Master Richard Rooley and Assistant Peter Blair Fish after the Service*

Richard told us about the Revd. Francis Wollaston who was Rector of St Vedast from 1779 to 1815. In addition to being Rector, Francis was an Astronomer of note and a Fellow of the Royal Society. Both his father and his son William, who developed the Wollaston prism, were also Fellows of the Royal Society. Family conversations were very much on science and engineering as well as religion. William's work on Mass Spectrometry was too early to be at a Babel Gate itself but was a step toward the current dramatic development from relativity to quantum mechanics.

Some will want to hang on to the gate to stay in old science but others will happily pass through in joy and anticipation of what may be revealed by the science and by God himself. We have research, experimentation and inspiration and as Christ said those with eyes to see and ears to hear let them see and hear.

In 2009 we are truly in a Babel Gate with our traditional comfortable world in a great confusion of financial, political and social pressures. Some religions are declining whilst others are growing with a hunger for spirituality and to see God through science and philosophy. When we enter and pass through a Babel Gate, or Gate of God, we must use all the old knowledge with new understanding to see through the glass darkly to the divine.

In the Company we have our own small Babel Gate each year when with a new Master and Wardens there is always a slight change of course. The gift of an Annual gate is particularly strong this year having completed 25 years as a Livery Company and we look forward to our 50th Anniversary aware of our place in God's Great Scheme.'

After the Service we returned to the wax Chandlers' Hall for a joint reception with the Ladies who then went off to their own hen party in the Red Herring, close by, whilst the Liverymen and prospective Liverymen dined in the Hall. Two of our Liverymen were celebrating marriage or prospective marriage so the Ladies' supper really was a hen party! More details of the happy couples are in Personalia.

*The Master's Lady, Jeanette, with the two brides at the Red Herring*

After dinner the Master exchanged Loving Cups with the Master Elect and Wardens Elect and the new Liverymen told those present about their careers.

*The Master Elect, Chris Price OBE FREng.*

Speaking after being welcomed as the Master-Elect at the Election Court Dinner, Chris Price 'first thanked the Master and the Court for giving him the opportunity to represent the Company and to play his part in taking it forward. Chris said that he and Sylvia were greatly looking forward to their year.

Chris said that it is a particularly important time for the Company, now that it has celebrated its 25th anniversary. It has been well led and is well established, outstanding among modern livery companies, chartered and thoroughly well-engineered.

He said that he hoped we could, together, think about how we would like it to be, and to be known, after another 25 years.

Chris asked:

- Should the Company be more influential? At a time when even the Prime Minister is saying that it is time for "less financial engineering and more real engineering", he said the answer should be yes.
- Should it be more charitable? If just over 100 livery companies give a total of £40m each year to charity, then perhaps our Company could expect to do rather more than its £25,000 a year in the future.
- Should the Company be more engaging of its membership? He had been approached by several liverymen who enjoy the Company's events but who feel that they would like to do more for it and its objectives.

These questions were all greeted with sounds of approval by the members at the dinner. As a final question he asked, "What else?" before saying that he would work with the Wardens, the Court and the wider Company to plan further development.

Chris did admit to some trepidation, saying that all Masters' years have their challenges but saying that while the current global financial crisis would be bound to have an impact on the Company and its members, he hoped it would not hold us back.'

*Raymond Cousins*

# VISIT TO THE HOUSES OF PARLIAMENT 17 March 2009

On a delightful spring morning, the Master welcomed 30 Members and guests to our Spring Outing at the Houses of Parliament, the visit being hosted by Baroness of Writtle.

Our introduction to the Palace of Westminster was via the new visitors' entrance, recently completed at a cost of ten million pounds. With the latest security screening equipment it was all somewhat out of place in this historic Palace. Following initial congregating in Westminster Hall we were shepherded into two groups each being accompanied by excellent guides.

*The Palace of Westminster*

Our tour commenced in the Dressing Room of the House of Lords used once a year for the dressing of the Queen prior to the State opening of Parliament. On through the Victorian splendour of the Royal Gallery with a fresco on each side of Trafalgar and Waterloo accompanied by many Royal portraits. Next we visited the Princes Chamber which is often known as the Tudor Room with portraits of all Henry's wives.

The House of Lords followed in all its splendour, the throne presiding over the Chamber. The Government and Opposition benches on either side accompanied by the cross benches and the woolsack. An establishment of respectful protocol which is currently subject to gradual change.

As we moved on to the House of Commons via the Central and Members' Lobbies we noted the change of

décor resulting from the rebuilding of the Lower House after the Second World War. We walked past the statues of Churchill, Attlee, Thatcher and Lloyd George into the House of Commons, a scene familiar to many of us from television news. The Speaker ensuring fair public debate. The Government & Opposition Benches, the dispatch boxes, public and press galleries with the recent addition of security screens complete the scene. A House of great presence and the heart of our constitution.

At this point we bad farewell to our excellent guides and joined Baroness Platt in the Attlee Room for an excellent luncheon. Outstanding food and wine, together good conversation, were rounded off with warm words of thanks to Baroness Platt for her sponsorship of the event

The visit concluded with an excursion across the road to the Jewel Tower, one of only 2 surviving buildings form the medieval Palace of Westminster. Here we viewed an exhibition of Parliament history and its workings today.

A splendid day enjoyed by all

*Alec Osborn*

# INSTALLATION COURT, COMMON HALL AND LIVERY DINNER, PAINTERS' HALL, 21 April 2009

This year the Installation Court Meeting was held at the Painters Hall in Little Trinity Lane. The present Hall, which houses a magnificent collection of paintings, was completed in 1961 after its partial destruction in the Blitz.

After the private Court Meeting for general business, the Court reconvened with guests and members of the Company for the investiture of four Liverymen; Mr. Iain Cameron Conn, Mr. Windsor Coles OBE, Mr. Michael John Neale OBE, and Alderman Michael David Bear. Photographs of the new Liverymen can be found in the Personalia section at the end of this issue.

The Court Meeting then closed and the Master, Mr. Tony Roche opened Common Hall, the Company's Annual General Meeting, and gave his report on the year and presented the accounts. The Master then installed his successor Mr. F. Christopher Price OBE for the coming year.

*The New Master Chris Price presenting Tony Roche with his Past Master's Certificate*

The new Master congratulated Tony Roche on an excellent year that had seen the 25th Anniversary of the founding of the Company. He stated that his objective in the coming year would be to prepare the Company for the next 25 years with a view to the appearance of the Company on its 50th Anniversary. The new Master then invested John Robinson, John Banyard and David Scahill as Senior, Middle and Junior Wardens, respectively.

The new Master then announced that Mrs Jean Venables OBE, Rear Admiral Neile Degge Latham CBE, Professor Andrew George McNaughton, and Air Vice-Marshal Graham Skinner CBE RAF, Clerk to the Company since 2003, had been elected to the court. All except Jean Venables, who is currently President of the Institution of Civil Engineers and could not be present as she was engaged on Institution business, were duly installed as Court Assistants. Mrs Venables will make her declaration at the Court Meeting which will held on July 7th.

Air Vice-Marshal Graham Skinner then duly resigned as Clerk, and retook his seat at the Master's table transmogrified as Honorary Clerk. A position he will hold until the instatement of a new Clerk.

*The Master with the New Liverymen*

After closing Common Hall the New Master and Wardens received the Company guests, which included Masters and Clerks from eight City Livery Companies, Ms. Terry Marsh of WISE and Mr. Martin McCann the CEO of RedR UK. The Company was called to dinner by a trumpeter from the Connecting Arts Brass Quintet who entertained with lively music during dinner.

*The Master and Sylvia Price, Lord and Lady Broers*

During Dinner, the new Master thanked the immediate Past Master, Tony Roche, for his leadership of the Company during the last year and presented him with the Past Master's Goblet.

*The Master presenting the Immediate Past Master with his Goblet*

On this occasion, the Goblet was of significance since it was the one used by the Founder Master, Sir Peter Gadsden. After a fine meal, the Master proposed a toast to Guests to which the Principal Guest, Lord Alec Broers FREng FRS, the immediate Past President of the Royal Academy of Engineering and former Vice Chancellor of the University of Cambridge responded. Their speeches are reproduced below. In an additional comment Lord Broers said that one of the first things he was asked to do in the Lords was to chair an enquiry into preparations for pandemic infections (just like the swine flu concerns which came to light just a couple of days after the dinner). He made the point that he was barely qualified to do so, but having just taken part in the Loving Cup Ceremony, he reflected that it must be a very effective way to spread such infections. (*Former Liveryman the late David Train, a chemist and pharmacologist always said that the silver of the cup always killed the germs very quickly but I am not sure I ever believed him. Ed)*

*Clive Walker*

## THE MASTER'S SPEECH

It is my pleasure to welcome you all to Painters' Hall, this magnificent home of the Painter-Stainers Company, a Company formed by amalgamation in 1502. It was given its hall just 30 years after that, but unfortunately it had to be replaced twice due to the ravages of the Great Fire of London in 1666 and theBlitz in 1941. What a superb collection of Royal Portraits the Company has on display here!

Please join me in thanking the Painter-Stainers Company for the use of their fine Hall today; our caterers for an excellent dinner, and our musicians, the Connecting Arts Brass Quintet for our lively music at dinner.

Today's proceedings have only allowed me to briefly thank Immediate Past Master Tony Roche and Jeanette for all they have done for the Company during our 25th Anniversary year. They have made it a very special year for us. Tony is one of the country's foremost railway experts and has woven his huge programme of events representing our Company as Master in with his role as a Director of First Class Partnerships, the organisation that provides *all the expertise* that *anyone* needs to set up and operate a railway company today. We have certainly had a first class year under his leadership which included, during our anniversary out-of-town weekend in Shropshire and at Ironbridge, a steam-hauled railway journey between Bridgnorth and Kidderminster. This was personally supervised by the Master Engineer, which must have surprised the Severn Valley Railway Company! Tony and Jeanette, we are truly grateful for all you have done for the Company during the last year.

Thinking of our 25 years and the long histories of companies such as the Painter-Stainers, I have posed the question of what we would like the Engineers Company to look like after another 25 years. We have

a well-established and well-respected Company, indeed a "Well-Engineered Company" to quote the title of Past Master Gibson's history of the Company (a copy of which will be presented to our principal guest later this evening). I suggested at the Election Court Dinner that we might want the Company to be more influential, more charitable, more engaging of the talents of our whole membership, and the response was positive. I am pleased to say that the Wardens and the Clerk have started to work with me on new strategy that will pick up these and other points and allow us to make proposals to the Court so that we can start to do the things that will make our Company even stronger.

We start into our second 25 years with 4 new liverymen clothed today. They are Iain Conn, Windsor Coles, Michael Neale (another past president of IMechE) and Alderman Michael Bear, who is already a Liveryman of both the Paviors' Company and the Company of Chartered Surveyors. His first degree was in Civil Engineering and he has worked extensively in the construction industry both internationally and in the City. Alderman Bear was a Sheriff in The City of London in 2007/2008 and he has been successfully appraised by the Panel dealing with Aldermanic Progression. We are very pleased that he has joined our livery.

*The Master Chris Price OBE, FREng proposing the Toast to the Guests*

And we have 4 new members of the Court, Jean Venables, President of the Institution of Civil Engineers (who is unable to be with us as she has presidential duties to perform today), Professor Andrew McNaughton, Rear Admiral Neil Latham and Air Vice-Marshal Graham Skinner, recently our learned and gallant Clerk and fortunately now our Honorary Clerk, while we appoint his successor. I would just like to repeat the sentiment expressed at the Court meeting earlier today of our sincere appreciation of Graham's tremendous work for the Company as Clerk, and the support his wife Margaret gives us on occasions like this.

Among our guests this evening, we are very pleased to welcome the Masters, and in one case the Prime Warden, and accompanying clerks of other livery companies, the Plumbers, the Blacksmiths, the Framework Knitters, the Master Mariners, the Scientific Instrument Makers, the Chartered Architects, the Constructors and the Firefighters. The Company of Framework Knitters has very strong links to the East Midlands, where I have lived and worked, and I was surprised and delighted to meet the then Senior Warden of the Company at a party held by mutual friends in Leicester last summer, so it is great to welcome him now we have both stepped up to be Masters of our companies, and for Sylvia and me to welcome his wife and our hosts of that party in Leicester as our personal guests.

## LORD BROERS' SPEECH

Thank you Chris. It is a great privilege to be able to respond on behalf of the guests and to propose the toast to the Worshipful Company of Engineers at this splendid dinner.

I am also very pleased to be invited to speak as it gives me a chance to congratulate you formally on becoming Master and to recognise and thank you publicly for what you have done for the engineering community as a whole and especially as Treasurer of the Royal Academy. You served two full terms as Treasurer - a total of six years - during which the turnover of the Academy increased "manyfold" and there were plenty of opportunities for things to get out of control but your steady hand and wise counsel saw us through without difficulty - but of course you are an engineer. Heaven help us if we had made the mistake of finding a banker to look after our finances. But from my selfish point of view it meant that despite the fact that our activities were expanding so rapidly I, as President was able to sleep calmly in my bed at night. Yours' was quite an achievement and I am sure that The Company can look forward to your Mastership with the confidence that comes from knowing that there is a strong and steady hand at the helm.

I have been very pleased to see how well the Worshipful Company has established itself in the City and as part of the national engineering community, and have appreciated the close links that have been maintained with the Royal Academy. I am also aware

of the role that my fellow past presidents and other members of the Academy have played in the Company's activities. It was partly because I observed that the Company was in such good hands that I have not sought active involvement myself. It was also because I felt that I already had more activities than I could handle and was reluctant to take on more and end up not being able to make an effective contribution. This was reinforced when I entered the House of Lords and found myself chairing the Science and Technology Select Committee which is one of those open ended jobs that takes as much time as one can find. There are very few of us in Parliament who have been practicing engineers during their careers, as opposed to just being managers of engineers, and I find myself frustrated at times when I feel that almost no one knows how products are actually designed and anufactured. This is clearly of the greatest importance to the nation now that making money by processing other peoples' money is inevitably going become less profitable. We urgently need to re-establish our manufacturing industries and this is the task of engineers, and programmes designed to help these industries, should be guided by engineers.

*Lord Broers in full flow*

Which leads on the realization that, regrettably, within Government Departments many who draft recommendations have no science let alone engineering experience. In addition most Departments have Science advisors when in fact they would be better off with engineering advisors. The House of Commons Innovation, Universities, Science and Skills Select Committee in gathering evidence for their recently published report on Engineering in Government asked us whether we thought it would be sensible to have Chief Engineering Advisors alongside the Chief Science Advisors in some Government Departments. My personal response was that they had it the wrong way round and that the question they should be asking was whether it was necessary to have science advisors to work alongside engineers. Phil Willis, the chair then asked me what was my answer to that question. I replied that the answer was probably no because to be classed as competent, engineers should have a thorough knowledge of the science of their speciality. I was pleased that this exchange was not only included in the Hansard transcript of evidence that accompanied the Report, but was quoted in full in the body of the Report, which makes me optimistic that our point is being taken seriously. Engineers are in effect scientists who have gained the additional knowledge necessary to make science useful. It is engineers that are needed to fix our economy and come up with practicable solutions to the supply of, for example, carbon free energy. Science forms the base for engineering and it is essential to maintain a strong science base, but if we wish to make money, as opposed to spending it, we need engineers. Scientists spend money, engineers make it. I am optimistic that this is being taken on board, and was encouraged when Peter Mandelson said that what we needed was more real engineering and less financial engineering, and even more encouraged when the Prime Minister promptly plagiarized him and used the same phrase.

Now, in concluding, it is my pleasant task to propose the toast to the Worshipful Company of Engineers. But before I do so I would like to tell you a little story brought to mind by the very name of the Company. You see I rather like the word Worshipful, although it must be said that in this country engineers are not at the top of the list of people who are worshiped, but things are improving as I have just said. It also reminds me of an occasion, or occasions with the Duke of Edinburgh, who by the way has done more for engineers than almost any one else in the UK. The occasions were the formal lunches we used to hold in Cambridge University to honour the University's honorary graduates. The Duke, as Chancellor of the University, presided at these lunches and we used to have a Master of Ceremonies who would introduce the Duke, the Mayor of Cambridge and myself at the beginning of the lunch in a booming voice by saying "Please be upstanding to welcome His Royal Highness the Duke of Edinburgh, The Right Worshipful the Mayor and The Right worshipful the Vice-Chancellor. We would then sit down and the Duke would turn to me and say "what's all this worshipful business, why are you worshipful and I am not?" I never found a satisfactory answer, but I am sure His Royal Highness is pleased that this Company is worshipful.

So may I thank the Company on behalf of the guests for this most enjoyable evening and ask you to rise and drink to the toast: "The Worshipful Company of Engineers – may it flourish root and branch forever, especially in the year in which Christopher Price is Master" - The Company!

# BROOCH LUNCHEON
# WAX CHANDLERS' HALL
# 22 April 2009

This delightful event is the culmination of the Installation Ceremony held on the previous evening. Jeanette Roche in her last act as Master's lady hosted a luncheon for 12 ladies in the dining room on the ground floor of the Wax Chandler's Hall.

Jeanette delivered a short speech before lunch outlining some of the highlights of her year being the 25th Anniversary of the Company and she reminded the ladies that the Brooch Luncheon had been started

by Joan Clerehugh fifteen years previously. A particular highlight of the year was the ladies luncheon last October when the speaker had been Helen Caufield who spoke on the work of RedR.

Before handing over the Master's Lady's Brooch Jeanette thanked everyone for their support during the past 12 months and wished every success to Sylvia and Chris Price in their year to come.

*Jeanette Roche presenting the Master's Lady's Brooch to Sylvia Price*

Sylvia most graciously thanked Jeanette for all she had done for the Company. Sylvia also paid tribute to Joan Clerehugh who was sorry not to be present due to another commitment. Sylvia told the ladies of the unique friendship she had enjoyed since joining the company when she was introduced to many new friends at her first luncheon by Jean Turner. She was confident that she would have lots of friends supporting her as she started her year as Master's Lady.

Sylvia presented Jeanette with a replica brooch (originally presented to the Company by David and Winifred Mitchell) to be worn with pride at future Livery occasions.

Having completed the formalities the ladies enjoyed a relaxed and most delicious luncheon.

*Jenna Davies*

# MEMBERS' BRIEFING
# WAX CHANDLERS' HALL
# 21st May 2009

The success of a New Members evening in 2008 resulted in a second gathering at the Wax Chandlers Hall in 2009 attended by 33 people, including partners.

After a welcome by the Master and Clerk (above), the establishment of the City of London as a world financial centre, and its relationship with the Livery Companies was outlined (not mentioning the recent financial upheavals). The older guilds were concerned with apprentice training and craft standards, but were suffering hard times after the industrial revolution. In the late 19th century, a revival in interest, while still maintaining the emphasis on education and standards, resulted in the formation of the Modern Livery Company, with a professional membership base. Our Company is relatively new, but was notable in the speed with which it progressed from initiation to a Company with a Royal Charter in 21 years. The Liverymen of the company participate in the voting for the Lord Mayor and Sheriffs of the City.

The smooth running of the Company results from following an annual cycle of events, outlined by the Clerk with the aid of a chart, and requires thinking ahead for at least two years. With the help of the Senior Warden, the associated committees, and the role of the Wardens in chairing them was explained. The Beadle gave an account of his duties, which apparently some centuries ago were classed as more

deserving than the Clerk, and that he was provided with a staff to protect the Master when out in the City, and to keep unruly apprentices in order! Meanwhile, he had to look after the day to day affairs of the Company office, which included polishing all the silver that was on display this evening.

Following a light supper, the Clerk to the Wax Chandlers explained that a Company Hall was for use as a trade court, an admin centre, a meeting place for members, and a venue for quality checking – hence the origin of HALL MARK as confirmation of quality of goods. The Wax Chandlers were looking for a site for their hall in 1636, since when there has been a history of disasters and rebuilding, the present hall being their sixth. Attempts to annexe the site by the adjacent Goldsmiths Company had been withstood, though a 3 metre strip had been lost during the development of Gresham Street.

Recently, our company records of 25 years had been produced as hard copy of archival quality in 7 bound volumes. These were now presented to the Guildhall

Archivist, Mr. Matthew Payne for safe keeping in the public domain.

The Editor of 'The Swordsman' reviewed the growth from a single A4 news sheet to the Swordsman magazine starting in 2000 which introducted colour illustrations. Issue 22 was currently in production.

Finally, we were reminded that the Livery operated under the terms of our Royal Charter, but the charitable Trust was a separate operation to meet the requirements of the Charity Commissioners. The member's response to the recent survey of how money should be raised was being reviewed.

*J. Edward (Ted) Roberts*

# AWARDS AND LIVERY DINNER SKINNERS' HALL, 7 JULY 2009

The cedar-panelled elegance of the banqueting hall of the Worshipful Company of Skinners was the venue for the 2009 Awards Livery Dinner. The Skinners' kitchens provided an excellent dinner of Welsh lamb fillets, no doubt chosen in honour of the principal guest, Mr Peter Jones, the Mayor of London's Nominated Member of the London Waste Advisory Board, whose occasional slipping into a rich Welsh accent during his speech added additional authenticity to his anecdotes.

The prizes were presented to a cross section of younger engineers from the fields of research, industry, education and of course the armed services, some of whom had earned their awards through operational activities in Afghanistan.

Musical accompaniment was provided by the Connecting Arts Brass Quintet. A departure from the usual military ensembles that grace this event, their euphonic tones nevertheless lent a martial air to the proceedings.

After the dinner, the Master proposed the toast to the guests and Mr Peter Jones responded with a speech that emphasised the need for modern industrial economies to take seriously the question of waste and urged engineers to develop technologies that used the earth's natural resources more efficiently, are bankable and capable of broad acceptance by society.

*Chris Elston*

# THE ENGINEERING AWARDS

## Baroness Platt of Writtle Award

*The Award has been established to recognise engineering excellence amongst those pursuing final year studies leading to the academic qualifications for entry to the Engineering Council's Incorporated Engineer grade. The Award is named after Court Assistant, 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 consists of a prize, medal and certificate. The Award was made for the first time in 2002 and The Engineers' Company wishes to acknowledge the assistance of the Institution of Engineering and Technology in selecting the Award winner.*

**Winner 2009 (Prize £1000) – Peter O'Donoghue** completed a Higher National Certificate in Automotive Engineering at Cork University of Technology in 1998. Since then, he has worked for BERG Electronics and BioTector Analytical Systems as a technician, and for De Beers UK Ltd where he is now a Principal Service Engineer. He has studied part time for ten of the past eleven years, culminating in a first class BSc (Hons) in Electronics & Computing at the University of Westminster in 2009. For his final year project, he designed and built a low cost portable instrument to monitor and record the concentration of carbon dioxide. He is now responsible for the UK diamond sorting facility of De Beers UK Ltd, which uses high speed machines to process images and signals. He led a project to reduce energy consumption and running costs by reducing the running time of machinery and reduce the size of vacuum pumps.

## Stephenson Award

*The Award is intended 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 150th Anniversary of the Grant of their Royal Charter. Donations in excess of those needed for the Loving Cup were used to establish the Stephenson Award and further donations were received in later years. The Engineers' Company acknowledges the assistance of the Institution of Mechanical Engineers with nominations for this Award.*

**Winner 2009 (Prize £500) – Peter Buckley** is the Business Links Co-ordinator for Watford Grammar School for Boys, Watford. Prior to this appointment he worked with BP Exploration and from 1990 joined the teaching profession at the school specialising in the Engineering Education Scheme where he has been responsible for over 60 students many of whom are now studying engineering or taken up a career in this field. He also has developed an Engineering Education Scheme link with the Watford Grammar School for Girls. Additionally, Peter has been running a successful Young Engineers group at school. Furthermore he is a teacher advisor to the Engineering Development Trust and a valued member of the National Advisory Committee.

## The Fiona & Nicholas Hawley Award for Environmental Engineering

*The Fiona & Nicholas Hawley Award was established in 2006 and is made annually to recognise excellence in environmental engineering to a resident of the UK, under 30 years of age at the date of submission, who holds a graduate or post graduate degree in engineering or science from a recognised UK university, or who is studying for a post graduate degree at such a university.The Hawley Award is aimed at inspiring younger engineers to present a project that has at least reached prototype stage in meeting three tests of social, economic and environmental sustainability.*

**Winner 2009 (Prize £5000) – Helen Bailey** is a civil engineer working with Aggregate Industries UK who had the bright idea to experiment with waste vegetable oil as an alternative to bitumen as the binder in asphalt to overcome separate environmental challenges: reducing the need for bitumen and beneficially exploiting a waste material, without loss of performance in the asphalt. According to the Mineral Products Association (MPA) the asphalt industry produces approximately 25 million tonnes of asphalt every year,

requiring a considerable volume of bitumen (about 1.25mt) at a significant cost to the UK trade balance. An alternative use for waste vegetable oil has been identified, researched and developed for use in asphalt, which is proven to achieve the same key properties as bitumen in the asphalt mix and, in so doing, uses a current waste product, reducing reliance on imported expensive hydrocarbons. Furthermore, the substitution of bitumen with waste vegetable oil can reduce the embodied carbon footprint of resultant asphalt products. Following extensive research and development, Helen has demonstrated that all the key material specification requirements using waste vegetable oil in the asphalt mix are comparable with that obtained from bitumen and are compliant with UK Standards. Patents are in the process of application.

## 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 2009 (Medal) – Ruyi Hu** is a Process Development Engineer with United Utilities Group PLC, where he works on the design of new wastewater treatment processes for digestion intensification, as part of the company's commitment to carbon reduction and sustainability. His major achievement has been the discovery and development of Inverted Phase Fermentation (IPF) technology, work which has been undertaken as part of a Knowledge Transfer Partnership with Cranfield University. Ruyi graduated from Central South University in China with a BSc in Pharmaceutical Engineering in 2005. He then gained an MSc award in Pharmaceutical Engineering at Loughborough University in 2006.

## Mercia Award

*The Award is made annually to a student under 30 and provides a medal and bursary towards the cost of a taught or research programme of postgraduate studies in Medical Engineering.*

**Winner 2009 (Prize £500) – Barry Lovern** is at Cardiff University undertaking a PhD in Medical Engineering and his research is concerned with the classification of shoulder function in healthy and pathological subjects using 3D motion analysis techniques. He has a wide interest in medical engineering, is a frequent collaborator with orthopaedic consultants, has an honorary NHS contract and frequently attends clinic and views surgeries. In his spare time, he is heavily involved with charity work through "Engineers Without Borders UK" a student formed charity whose mission is to facilitate human development through engineering by international development and humanitarian aid. He has been responsible for training events for relief workers, including courses offered by RedR, and for community based projects and training in alternative and sustainable energy. *Barry Lovern was unable to be present*

## 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 and now a Past Master. The Awards are for excellence on an accredited undergraduate engineering course conducted at one of the 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 2009 (Prize £2500) – Prakash Senghani** from City University is a versatile and dynamic civil engineering undergraduate who from a strong field particularly impressed the selection panel with his exceptional drive, enthusiasm and clear sense of direction for a career in the engineering profession. Passionate about the need for responsible and sustainable development, he also displayed evident business and commercial sense and a clear ambition to contribute to engineering at high level. He had also clearly impressed both his university, which has offered him a sponsored PhD course, and his attachment company which has offered him a job. With a wide range of interests and irrepressible energy, and displaying clear potential for senior management, he is well-deserving of this Award. *Prakash Senghan was unable to be present.*

# THE SERVICES ENGINEERING AWARDS

## The Services Engineering Undergraduate Award

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

**Officer Cadet Paul Young** graduated from the Defence 6th Form College with 4 "A" levels having acted as Deputy Head Student of the College in his final year. He studied Mechanical Engineering at the University of Newcastle Upon Tyne over the period Sep 04 – Jun 08, graduating with a 1st Class Masters degree in Mechanical Engineering. He was a vital lead member in his faculty's Formula Student team and personally raised some £12000 to help fund this challenging engineering project. Concurrent to his excellent academic contribution, he still found time to add much value within Trojan Squadron whilst at University, involving himself wholeheartedly in all manner of activities.

These activities included unit attachments, sport and a considerable amount of adventurous training including organising high risk mountaineering/trekking expedition to Mongolia. OCdt Young also took part in the Volunteer Africa programme in 2005, helping to build a school in Tanzania and personally raised £1500 for this worthy cause in the process.

## 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 Paul O'Sullivan RN** completed the Nuclear Advanced Course at the Nuclear Department, HMS SULTAN in September 2008. He achieved an outstanding performance with an average overall mark of 72.6%. He was awarded the NAC Course Certificate with distinction and an MSc Degree in Nuclear Technology and Safety Management from Cranfield University. His excellent course mark reflects his high academic ability and determination to succeed in all subjects. During the project phase of the Nuclear Advanced Course, Lt O'Sullivan demonstrated excellent leadership, mentoring, management and team skills when leading the successful Anglo-French design study of a supercritical carbon dioxide cooled gas reactor for an aircraft carrier application. He was recommended for the award of the Institute of Nuclear Engineers Prize, for highest overall performance on the course.

## The Services Engineering Training Awards

*Awarded to a Warrant Officer or Senior Rating / Non Commissioned Officer of each of the three Services for outstanding achievement in initial or continuing engineering training, measured through leadership and the professional inspiration given to others.*

*Nominations are invited from: Defence College of Electro-Mechanical Engineering, HMS Sultan; Maritime Warfare School, HMS Collingwood;Defence College of Communications and Information Systems; The Royal School of Military Engineering and Defence College of Aeronautical Engineering*

**Royal Navy – Chief Petty Officer Marine Engineering Mechanic David Jewitt's** leadership and inspiration of the Royal Naval School of Marine Engineering's phase 2 trainees has been exceptional. He has led from the front, always set the highest of standards and motivated all trainees to aspire to match them. His contribution to the quality of training, particularly in

blending Military Skills and submariner training with technical learning to meet the modern Fleet's requirements has been remarkable.

**Army – Staff Sergeant Graham Lumsdon** is an

Aeronautical Engineering Technician SSgt serving in a role normally reserved for the more highly technically trained Artificer SSgt at the Defence College of Aeronautical Engineering (Arborfield REME). He has positively thrived on the challenge, proving to be equal to the task both technically and militarily. He quickly identified the need to place technical training in context if students were to truly understand their trade and has organised relevant visits and presentations to achieve this. He has made a major contribution to an ever-increasing first time pass rate for avionic students. Smart and fit he participates in and organises sporting events and encourages trainees to take part no matter what their abilities. An enthusiastic mentor who is dedicated to his craft, SSgt Lumsdon has proved truly inspirational to his trainees.

**Royal Air Force – Chief Technician Derek Gladman** is employed as an instructor on Trade Management Training at the Defence College of

Aeronautical Engineering (Cosford) which prepares newly promoted sergeants for their responsibilities as senior non-commissioned officers. He has been a driving force behind the improvement of this course to bring it up to date to focus on the diverse managerial role of a Royal Air Force sergeant in a modern expeditionary air force. He has also sought to gain professional recognition for the skills of the NCO cadre. Through his drive and determination he has continued to promote the professionalism and high standards of the Royal Air Force and provide the trainees with a qualification of which they can be rightly proud.

## 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

*(Called the "Thunderer" award to sustain the heritage this name within The Worshipful Company of Engineers)*

**Lieutenant Joe Stevens RN** has served as a helicopter

structural Repair Officer in Afghanistan for 10 of the last 18 months. Demonstrating outstanding leadership, his work has required exceptional engineering judgement, frequent technical innovation and excellent communication skills to maximise aircraft availability in support of war fighting operations. Routinely delivering rapid, pragmatic and innovative repair solutions for a range of military helicopters, he has led his small team to excellent effect in conducting repair activity in the forward battle-space, including during active hostilities. Overall his efforts have exemplified the utility of the operational engineer in maintaining front line military capability.

## Royal Engineers Operational Engineering Award

**Major Peter Helme** deployed to Afghanistan as an Infrastructure Staff Officer in July 2008, responsible for managing almost 500 projects in the £200 million infrastructure works programme supporting British Forces across Afghanistan. His role took on even greater importance as the campaign moved from an

expeditionary to a campaign footing. He was instrumental in producing the development plan for the Main Operating Bases, and his technical investigation of a bunker's collapse greatly improved safety. Demonstrating the ability to assimilate vast amounts of information and identify and prioritise key issues, he determined pragmatic engineering solutions to match local conditions. Major Helme worked tirelessly during his 6 month tour, greatly contributing to the enhancement of operational effectiveness on Operation Herrick.

**Royal Signals Operational Engineering Award**

**Captain Mark Todd** has been instrumental in the delivery of BOWMAN across the complex environment of 1st (United Kingdom) Armoured Division. Without BOWMAN training he applied first engineering principles to empower himself to become a leading exponent for the 3rd Operational Field Trail. The BOWMAN Combat Infrastructure Platform 5 programme has been directly influenced by him. The key areas are: Local Area System stability, collaborative working, development of the Data Storage Sub System and the Headquarters Server. He also designed and delivered a bespoke wide area system that was successfully deployed to the Czech Republic in support of Air Land Integration. He is now conducting experimentation and trials of the Tactical Network Gateway.

**Royal Electrical & Mechanical Engineers Operational Engineering Award**

**Major Simon Holford** has demonstrated outstanding commitment to engineering, to improving the professional standing of his Corp and to ensuring the needs of 4th Mechanized Brigade, including the wider Army, are met on operations. He has been instrumental in delivering unprecedented levels of equipment availability in demanding operational missions. Additionally he has identified cross-cutting technology to seek innovative solutions to Urgent Operational Requirements which has been essential to ensuring the Army's future success on operations.

**Royal Air Force Operational Engineering Award**

**Squadron Leader Sean O'Sullivan** is the Officer Commanding Quality & Continual Improvement Team at Royal Air Force Marham, where he has been at the forefront of change management on this operational-pivotal, front line Station. A strong leader in a challenging role, he pioneered a deployed Quality and Continual Improvement Model to standardize the in-theatre working practices for the seven GR4 Tornado Squadrons that roule through Afghanistan. By convincing the Station Commanders and Squadron Senior Engineers of the change benefits, the whole Tornado force will gain from this comprehensive safety and capability framework, and thereby ensure Engineering Standards and Practices in the most demanding of circumstances.

**The Services Engineering Support Award**

*Awarded to a serviceman who has contributed most, through the application of engineering skills including the use of leadership, management and technical acumen to meet material availability targets for any of the Armed Forces. The recipient would normally be chosen from the Defence Equipment & Support Organisation from a recommendation by the Chief of Defence Materiel.*

**Staff Sergeant Gary Holdham** is the Project Manager for Project FOLIO in the Helicopter and Islander Combined Project Team which is a £30M programme (5 Urgent Operational Requirements) to field a major upgrade for Special Forces surveillance aircraft and to deliver 4 additional airframes. Such a task would normally be allocated to a level higher than a SSgt but resulting success has been achieved through Staff Sergeant Holdham's outstanding engineering skills, leadership, management and technical acumen, in the acquisition and integration of new capabilities to meet defence wide needs.

## THE MASTER'S SPEECH

Wardens, Prime Warden, Masters, Ladies and Gentlemen,

Welcome to Skinners' Hall, very aptly described as "the country house venue in the heart of the City", and a particular favourite of mine as this was where I attended my first livery dinner of the Engineers' Company.

We are in the part of the city where skinners or furriers lived and traded as far back as the 1200's, indeed, Skinners Lane is just 150 metres away (a very reachable par 3).

The Skinners' Company has been meeting on this site since the end of the 13th century. This magnificent hall is essentially the 1680's rebuild of the original hall which was another victim of the Great Fire of London. Did you see the chandelier in the outer hall, originally made for Empress Catherine the Great of Russia and the large bell there too which cast in 1190, and is one of the oldest in the country?

Please join me in thanking the Skinners' Company for the use of their lovely Hall today; our caterers for an excellent dinner, and our musicians, the Connecting Arts Brass Quintet for their spirited playing to us this evening.

The presentation of our Awards is a major highlight of our Company's year.

Through our awards we address major objects of our Company, "to promote the development of the science, art and practice of engineering for the public benefit", and, to "... support and encourage standards of excellence in the profession of engineering". What a pleasure it is to be together to celebrate the impressive successes of our award winners across such a wide range of engineering, and both civilian and military fields.

We are very grateful to those members of our Company who have contributed to the establishment of our awards and to those who have given their time to promote our awards this year and to judge the entries.
Our learned and gallant Honorary Clerk, AVM Graham Skinner, has guided us skilfully through the winning entries, so thanks to him, and to our committee members and trustees for their careful consideration of the funding of this year's awards, pressurised as are other funds by the collapse in investment returns.

Our members have recently responded to a questionnaire about our charitable activity and a high proportion expressed their support for the awards and our promotion of education and training, so I hope members will respond well to a request from me to strengthen our charitable funds so that we can maintain and grow our programme.

But it is the Award winners who are the stars of this evening, and I congratulate them again on their successes.

I always have a special admiration for the winners of the medals which are our Services Engineering Awards. Here we see innovation, leadership and clear application of engineering principles that make a difference, especially today in Afghanistan.
These same qualities will be needed as our Armed Forces find a way to deliver **more** with **less money**, again, as one unfortunate consequence of the financial crisis.

Let us rekindle the spirit of the recent Armed Forces Day and on the day which is the 4th anniversary of the London Terrorist Bombings, let us express our deep and lasting thanks to our armed services through their representatives of here this evening.

Allow me to pick out just one of our members for special mention. Liveryman Sir Eric Neal lives in Australia where he is Chancellor of Flinders University in Adelaide, and we are very pleased that he is with us today.

Among our guests this evening, we are very pleased to welcome, from other Livery Companies, the Prime Warden of the Shipwrights, and the Masters of the Carmen, the Guild of Air Pilots and Air Navigators, the Marketors, the Fuellers, the Lightmongers the Information Technologists and the Guild of Educators.

Also among our Company guests this evening we welcome the supporters of our award winners including the highest ranking engineer officers from all branches of the services, and the guests who have helped me, and our principal guest, present the awards, including Keith Millard, President of IMechE and a liveryman; Major General Keith Cima, (Governor of HM Tower of London,) representing the new Chief Royal Engineer, General Sir Peter Wall, and, Air Marshal Kevin Leeson.

In the context of our awards, we also welcome Presidents of the Institution of Civil Engineers, Court Assistant Jean Venables, the Institution of Chemical Engineers, Richard Darton, and the Royal Aeronautical Society, Liveryman Mike Steeden, as well as the CEO of the Society of Environmental Engineers. We are also very pleased to welcome Ms Linda Scott, CEO of the Arkwright Trust, now that we have agreed our Company's first two sponsored Arkwright scholars, who are at London schools heading towards engineering at university and who will receive their awards at the beginning of the next academic year.

Additionally, I have a warm personal welcome for Sir Ralph Robins, formerly Chief Executive and then Chairman of Rolls-Royce plc and a truly outstanding engineer and industrialist. He made the vital investments in engineering & technology that have proved to be the basis of the company's success, but made him virtually no friends in the City at the time.

Popularity was not the issue, it was all about the future prosperity, possibly even the survival of arguably the greatest name in British engineering. Today, Rolls-Royce investing even further into future, in the teaching of science in schools, where its generously funded annual Science Prize helps teachers implement science teaching ideas. Perhaps one day a winner of the Rolls-Royce Science Prize will go on to win of our Stephenson Award as someone who has been particularly successful in encouraging young people to study engineering.

I am particularly pleased to welcome Peter Jones OBE as our Principal Guest. Peter is an Industrial Economist who has become a leading light in the practical and direct aspects of everyday environmental policy and management.

You might well have heard him on the Today programme on Radio 4 **talking rubbish**, or rather, talking **about** rubbish, and what we should do about it. Large Cities like London always have faced challenges dealing with their waste, and never more so than today when **all** the environmental impacts of what we do with the waste must be considered and minimised. Peter is the Mayor of London's guru on waste, and energy from waste. The policies and actions of City of London Corporation on environmental matters have to fit in with the recommendations of the London Waste Advisory Board where Peter speaks for Boris Johnson. He also regularly addresses the Sustainable Development Commission.

I mentioned that Peter is an industrial economist, rather than an engineer, but over the many years I have known him, I have seen and heard plenty of evidence that shows him to be very close to engineering. It is not so much his huge collection of railway memorabilia and the interesting vehicles he has had, but the things we have discussed about engineering practical and beneficial solutions to waste. So, on the evening when our award with the highest monetary value is the Hawley Award for Environmental Engineering, it will be good to hear Peter's gems from the world of challenges and opportunities in waste and energy.

It is a real pleasure to have Peter Jones as our principal guest this evening, accompanied by his wife Liz.

Finally, Sylvia and I welcome our personal guests and may I extend our members' welcome to all those personal and professional guests who are with us this evening. I hope you are enjoying your evening in the company of engineers.

Would **members** of the Engineers' Company please join me in the toast to **Our guests.**

# LONDON BRIDGE FAYRE 11th July 2009

Well the rain held off for most of the day and a grand total of 10 Engineers exercised their right as Freemen and drive the sheep across London Bridge; Court Assistants Pat O'Reilly and Barry Brooks, with Liverymen Bill Riordan, Keith Millard, Colin Davidson, Chris Elston, Derek Adams, Paul Wood, Alderman Michael Bear and John Huffell.

*Liveryman Alderman Michael Bear with the Lord Mayor ready for the Off*

The whole of London Bridge was closed with the sheep driving and at one point, a church service (there used to be a chapel on the bridge), going on in the middle; about 20 Livery companies exhibiting on one footpath and the gawping public on the other. The Companies there tended to be the craft based ones with things to demonstrate, with the Distillers Company being very popular for obvious reasons. Our landlord the Wax Chandlers were demonstrating the making of candles and Ironbridge Trust was there, doing quite well.

*The Pikemen have everything under control?*

The sheep were definitely more wayward than when the then Master Tony Roche and others did this last time; there was no friendly handler assisting you...you had them on your own. They were also shorn, so didnt look as fluffy, and were jumping about and facing the wrong way a lot; but Shep the sheepdog was there to keep an eye on things. Early drovers like Barry Brooks and the Lord Mayor, had the pikemen to lead them, but they went home about 1pm so the afternoon drives gave the Freemen more freedom.

*Sheepishly Richard Groome*

# VISIT TO ST PAUL'S CATHEDRAL 15th July 2009

On a pleasant evening in mid-July a party of some 26 Liverymen and their guests assembled beneath the portico at the West Front of St Paul's Cathedral. After a welcome by the Master, the party was greeted by the Surveyor to the Fabric, architect Mr Martin Stancliffe, who outlined the history of the site as a special place of worship over many centuries. While the whole of Wren's masterpiece, built between 1675 and 1710, offered many architectural treasures both on the grand scale as well as in the fine detail, the tour would focus mainly on the Dome and its supporting structures highlighting the evolution and ingenuity of the original designs, the consequences of natural settling, war damage, ravages of the elements and pollutants as well as the challenges facing the Cathedral authorities in preparing for the next century and beyond.

Our tour started, surprisingly for many, on the Paternoster Square side of St Paul's Churchyard as we descended not into the Crypt but into the cramped underground spaces which form the Fabric team's workshop. From there we progressed by a side entrance to the Crypt itself, first admiring the wrought iron gates installed as a memorial to Sir Winston Churchill. Passing on beyond the massive tombs of the Duke of Wellington and Lord Nelson, grand memorials marking the lives of other illustrious contributors to our history including Florence Nightingale, Blake, Reynolds and Wren himself, poignant tributes to lesser known but noteworthy players upon the stage in important scenes of the Nation's life, we climbed a few steps into the now deserted main body of the church, the overwhelming hush pierced only by our gentle footsteps and the sometimes dissonant bars from a practising organist.

Gathered at the west end of the Nave we listened intently as Martin explained the complexities of

scheduling routine maintenance in amongst the countervailing needs of the liturgical cycle, the City, organ practice and other scheduled visits. Being 'Master of the Fabric' carried little sway as his 'pieces of sky' lay at the bottom of the pile while the daily jigsaw puzzle was assembled. Turning to the £40 million programme of cleaning and repair to mark the 300th Anniversary of the Cathedral in 2010, the first time in its long history that the building had been comprehensively restored inside and out, Martin outlined the huge task which had set, amongst others, the challenge of how to enable extensive work at height while still leaving the building open for tourists and normal use. The solution for the Dome – revolving scaffolding – had offered the advantageous sequence of: clean a segment, move scaffolding, check, adjust and carry on. Nonetheless, for the Queen's Golden Jubilee, all scaffolding had to be cleared for a day – a job that the Fabric staff couldn't just leave to the contractors but had to manage themselves. Increasingly now, his team was placing a strong focus on sustainability – one example being the management of lighting levels through automatic dimmers.

After a quick review of significant architectural changes since the original construction, noting that some of Wren's impact, particularly the importance of the Dome, had been lost by opening out the Choir such that the Dome was now just part of a long axis rather than the dominant central feature originally intended, Martin went on to explain earlier responses to emerging faults in the structure. These included 18th Century concerns over cracks in the Dome structure as a result of which iron bars had been inserted to stop the transept walls falling out – later shown to be a misperception of the cause of movement; 19th Century plans to put "underground trams" nearer to the Cathedral which had to be overcome and early 20th Century references by RIBA to underlying 'slip sands' which had been very emotive. Although the huge amount of work done in the 1930's was probably overkill it had enabled the structure to withstand the explosion pressures from a World War II bomb. After more modern analysis, a horizontal crack (very unusual in a load-bearing structure) had been judged due to the settling of stones in the piers going down which in turn had led to the south transept being pushed out – though looking as if it were falling out. In recent times some £25K had been spent on a measuring system and the review of results had led (after appointment of new engineers) to a reappraisal which confirmed that most things were at rest – and had been for some time – thus dispelling the concerns of the last 200-300 years.

At this point, the group moved on from the Nave to the South West Tower and its spectacular stone staircase

*The Group need a rest just after starting up the stairs*

winding up the outer wall. In the early years there was no staircase at all as great wisdom was shown in delaying the build until after the heavy tower had settled. The staircase was not hanging but had complex loading resulting from each tread extending only 6 inches into the wall and being held with iron shims which then locked the stairs tight as they oxidised. Some steps had cracked all the way through but were still secure – though no-one, even from our more sceptical members, seemed keen to jump up and down to put this to the test! No relation between crack patterns and any one cause had been established although expansion of the oxidising iron had perhaps led to some. In the late 19th Century damage had been caused when a clock weight fell and bounced all the way down. A beautiful repair had been facilitated by the wonderful scaffolding built by the Royal Engineers for installation of the 'Great Paul' bell, though the Chapter couldn't afford to rebuild such scaffolding for later repairs. Modern methods now used resin and were less invasive.

In the first floor spaces above the West Door, the visitors delighted in seeing a great wood and plaster design model of the Cathedral together with many drawings, some illustrating very clearly the difficulty of dealing with the practicalities of the heavy Dome structure. Although application of the catenary shape in the construction of arches is ancient, other exhibits referred to rediscovery of the principle by Robert Hooke in the context of the Cathedral's rebuilding.

From here, while half the party negotiated their way downwards by lift or stair to secure our tables at "The Saint – Bar and Kitchen" in Paternoster Square and review their experiences so far, a dozen stalwarts continued their upward plod via the Whispering Gallery (259 steps above ground level) to the exterior

Stone Gallery (119 steps more) followed by another 152 to the Golden Gallery (some 280 ft and 530 steps above ground level) from which pictures showing the

*The Master closes his eyes to the wonderful view*

view can speak for themselves. The climb took stone, wooden and spiral metal staircases with periodic horizontal translations as our path followed the curvature of the inner Dome. At one point we were able to peer down, through a very thick glass plate, to the floor below and the organist, a mere speck, still at his console unaware of the gods staring down at him from the heavens. This view was later complemented, during the downward journey and after members had demonstrated their athleticism when negotiating a crossover between two opposing but adjacent sets of stairways, by peering over the rim of the circular opening at the apex of the innermost Dome ceiling. The organist was still to be seen – just slightly larger in appearance – and his music heard with great clarity. Thankfully, with the inner latent schoolboy in mind, no-one had an ice cream with them!

*Looking up in awe at the dome*

At each stage drawing upon the excellent working knowledge of Liveryman Dr Don Prichard, himself a Cathedral guide, Martin regaled us with yet more interesting facts and figures concerning the construction of this great edifice including the great chain encircling the Dome and buried in its walls. We marvelled at the boldness of the designers and skill of the builders who constructed the imposing arches of the Dome's main supporting structure, suspending the great stones by wrought iron 'sky hooks' from hidden arches and subsequently binding them together though, initially, with little else to hold them in place.

Just as they had given up hope of the summit party returning and were contemplating the task of dispatching huge quantities of the house signature dish: Fish Pie (and wine) by themselves, the groups were re-united just in time for everyone to enjoy an excellent supper and to express our collective thanks to Martin Stancliffe for his hugely informative and entertaining tour.

*Tony Willenbruch*

(St Paul's Cathedral website: Explore the Dome)

## GOLF AT THE WELCOMBE, STRATFORD-UPON –AVON, 26th and 27th July 2009

A warm welcome from the Master and his Lady greeted members on arrival at the Hotel, setting the tone for the subsequent two enjoyable days. After registration and a quick briefing from Doreen, of Fairways the event organisers, on the golfing arrangements, it was over to the Clubhouse for the player's favourite pre round snack – a bacon bap and coffee. The weather forecast was for day long light rain – but thankfully the Met Office maintained their track record!

*The Hotel and Sylvia and Philip on the16th Green*

The challenging course provided varied and enjoyable golf. Its undulating topography combined with a stiff

breeze provided for some interesting shots. 'Up and down' was not restricted to play around the greens and this persuaded some more members to hire buggies for the next day's competition! In the bar that evening I learned that the defending Champion had in his normal way released his golf cart to trundle unaccompanied along the fairway. But this was the 12th and the steepest fairway on the course – aptly named Poachers Drop. The result; cart, bag, clubs and sundry equipments arrived in the greenside bunker to give a good representation of a train wreck! The 'hill trick' was repeated by some fortunate players with ball alone - allowing them the pleasure of an amazing 300 yard drive as their tee shot rolled finally to a stop just short of the green!

Later that evening at dinner, the winners of the Sunday Fun competition were announced. With 75 points, it was 'Judy's Bunch' comprising Judy Ponsford, David Scahill and Graham Skinner. They were closely followed by the 'Terrific Trio' with 74 points (Sylvia Price, Philip Edwards, Ray Cousins). In 3rd place with 72 points was the aptly named 'Green Jackets' (Ruth Rooley, Peter Hammersley, Bjorn Conway and the Master). 'The Promising Youngsters', 'Helen's Hard Hitters' and 'The Last' completed the leader board - all to receive a becoming blue Engineers cap ready for the next days competition. David Scahill and Graham Skinner both shot net Eagles on the par 4 Eight – Wills View – no doubt inspired by its splendid elevated tee and panoramic views over the Warwickshire countryside.

*The Master with the Team Winners wearing New Caps*

A convivial dinner was made all the more enjoyable by the presentation of a congratulations card with best wishes from all present for an upcoming Golden Wedding Anniversary on the 15th of August. Peter and Cynthia Hammersley recalled spending the first night of their honeymoon in this very hotel – which at that time was without golf, spa or en-suite facilities. Further details of the evening were restricted to them having had scampi for dinner!

So it was that we awoke on match day to leaden skies and heavy rain – the Met boys had got that bit of their forecast right! But with tee off not till elevenish there was plenty of time for the forecast improvement to arrive. After a hearty breakfast - which taxed the kitchen's capacity to keep us supplied with bacon – it was off to the practice ground to hone the swings for the serious competition ahead. By tee off time, the clouds had parted and in glorious sunshine we got underway under the attentive eye of starter – Patrick - Doreen's other half. Apart from one very sharp shower about an hour into the competition we enjoyed a very pleasant day's golf.

All too soon we were back in the clubhouse with cards duly returned to Patrick who with the master presided over the eagerly awaited results and presentation of prizes. The Ladies winner with 29 points was Judy Ponsford. Sylvia Price on 27 points and Ruth Rooley on 24 points took 2nd and 3rd places respectively. Sylvia also won the nearest the pin 'stealing' the prize from her husband! The Men's winner with 33 points to complete the family double was Nick Ponsford . With two players sharing 31 points and two 30 points - John Ferrie, Mark Robinson, Chris Price and Richard Rooley completed the prize list with the order having been decided on count backs. Strong play was returned by David Scahill with 18 points on the way out, John Robinson with 21 points on the way in and Bjorn Conway enjoying a birdie on the 174 yard par 3 Eleventh. A most enjoyable two days drew to a close with the presentation of the Worshipful Company of Engineers Championship trophy.

*John Ferrie the 2009 Champion*

I'm sure all those who attended join me in thanking Chris and Sylvia for hosting a terrific two day event and thanking Fairways Golf for their supporting arrangements. As for me - well - I look forward to playing in next year's event - very unexpectedly - as defending Champion - and with my handicap reduced!

*John Ferrie*

# GLOBAL WARMING – AN OVERVIEW
## Liveryman Jeff Temple FIChemE

**Preamble**

The subject of Global Warming and Climate Change is immensely complicated, with many diverse strands and topics, only a few of which could be covered in a review of this nature, and even then not in great depth. This brief overview should therefore to be seen as just that, with a dip into some of the most important scientific and engineering points. It is the review and opinion of Jeff Temple, and does not represent the views of the Worshipful Company of Engineers.

**Introduction**

There is massive discussion concerning Global Warming, the causes, the effects, and then the solutions. Since the start of the Industrial Revolution the global temperature (of our lower atmosphere) has increased by approx 0.7°C. It has been proven beyond reasonable doubt that the Earth's climate is changing, and that this has been caused by human activity[1]. The Royal Society has said "The work of the Intergovernmental Panel on Climate Change (IPCC) represents the consensus of the international scientific community on climate change science. We recognise IPCC as the world's most reliable source of information on climate change and its causes, and we endorse its method of achieving this consensus." "**The balance of the scientific evidence demands effective steps now to avert damaging changes to the earth's climate"**[2]. Although, as I say above, "this has been proven beyond reasonable doubt" for the vast majority of the scientific community, there are many people who would question this and so this review does include a few words on the sceptics.

It is the intention in this present brief review of the topic to try to summarise the issues, with a focus on the science plus potential engineering solutions.

**Our Atmosphere**

The atmosphere surrounding our planet consists of an approximately 190 kilometre depth of nitrogen, oxygen, argon and water vapour. These work together to shield our Earth from the rigours of open space, and hold the average temperature at about 15°C. Without this insulating atmosphere, our planet would be a frozen ball of ice, with an average temperature of -18°C. However there are other gases which also hold in heat, the "Greenhouse Gases" (or GHG), such as carbon dioxide, methane and nitrous oxide, and which are in much smaller concentrations.

**Greenhouse Effect** (see Figure 1)

The greenhouse effect can be thought of as happening in several stages:
1. Sunlight ("solar radiation" describes the visible and near-visible - ultraviolet and near-infrared - radiation emitted from the sun) passes through the atmosphere without much being absorbed, and heats the ground.
2. The warm ground radiates infrared light.
3. Most infrared radiation from the ground escapes into space
4. But Greenhouse gases in the atmosphere absorb the IR light, and heat up, like any material body absorbing light energy. In this way some of the energy radiated by the atmosphere goes back to the ground, heating up earth, "the greenhouse effect

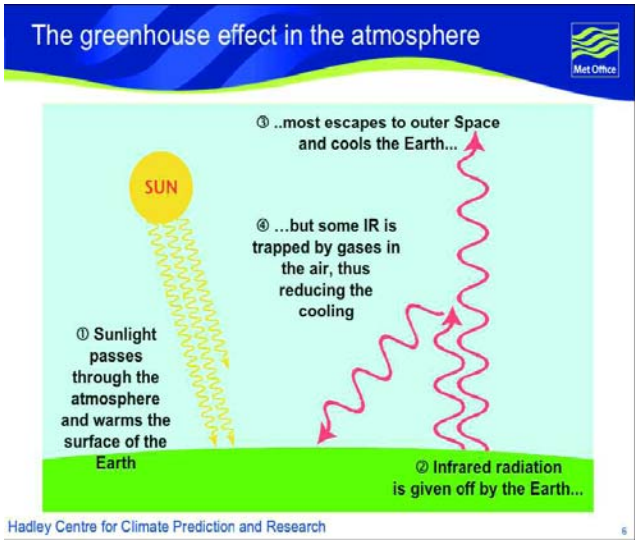



*Figure 1*

**Sources of Greenhouse Gases**

Our modern lifestyle requires car and plane journeys, construction with cement, energy to heat our homes, etc, and the majority of this energy comes from the burning of fossil fuels which release the principal component of global warming, carbon dioxide, to the atmosphere (see box "A Typical Car" below, to see an example of the production of $CO_2$). It does not take much to understand that generating all this $CO_2$ can and does have an impact on $CO_2$ concentration in the atmosphere. Balancing this increase is that $CO_2$ is absorbed by plants and forests, but our destruction of the Amazon Rain Forest, amongst others, has not helped.

***A Typical Car – Energy Fact***

*Think of a typical car, and making a few basic assumptions, say fuel efficiency of 7.5 litres/100 km, 20,000 km per year, we have 1,600 litres of petrol per year. However the combustion of hydrocarbons produces over 3 times more carbon dioxide on a weight basis than carbon consumed, since the bulk of the weight of $CO_2$ comes from the oxygen in the air, so this typical car will produce approx 4 tons per year of $CO_2$. Then add up how many cars are in use, and you can see the total $CO_2$ going into our atmosphere!*

Although other gases also have a greenhouse effect (methane has actually about 20 times the effect of $CO_2$), it is the $CO_2$ which is the primary culprit. Methane is short lived in the atmosphere as it degrades under UV, so despite emissions from ruminant animals and the hydrocarbon industry, methane concentrations in the atmosphere are about 200 times lower (approx 1,700ppb) than the concentration of $CO_2$. Samples from ice cores from before the industrial age, and therefore before extensive use of fossil fuels, show the concentration of carbon dioxide in the atmosphere stood at about 280ppm. From the beginning of the industrial revolution (about 150 years ago), when we started burning fossil fuels in large quantities, $CO_2$ concentration has taken off to present levels of approx 380ppm.

The Mauna Loa observatory, operated by the National Oceanic and Atmospheric Administration's Climate Monitoring and Diagnostics Laboratory [3], has been measuring carbon dioxide and other gases in the air since 1958. It is about 3,350 metres above sea level on the second-highest mountain in Hawaii, and this location means its measurements are from some of the cleanest air on Earth.

The Mauna Loa results (see Figure 2) showed $CO_2$ increasing by about 1ppm per year at the start of the period of results gathering, whilst today that increase is about 1.8ppm/year, i.e. the increase is gathering speed. A side note. The black line represents the yearly average. The red line shows the true $CO_2$ concentrations, with the rise and fall caused by the seasonal difference between the hemispheres, with the northern hemisphere having a larger land mass, and hence potential to absorb $CO_2$ in its growing season.

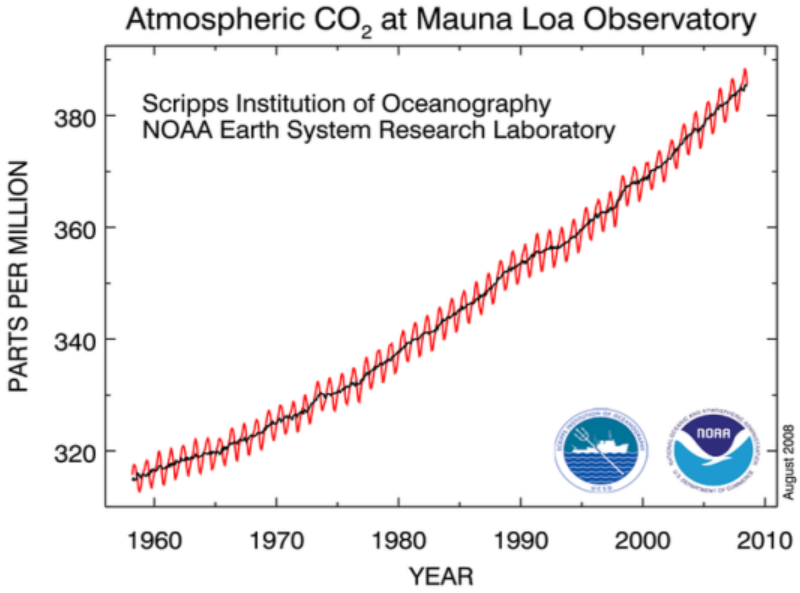



*Figure 2 Atmospheric Carbon Dioxide - Mauna Loa*

As confirmation for the source, the $CO_2$ from the burning of fossil fuels is isotopically different to the background $CO_2$, so this link to increased $CO_2$ concentration can be proven.

Now however comes the sting in the tail. The principal effect from the increased temperature has been an increase in water evaporation, which is also a potent GHG. So a positive feedback loop is created, forcing our planet's temperature to even higher levels.[4]

**Weather vs. Climate**

Weather is chaotic, climate is not. What we call the weather is a highly detailed mix of events that happen in a particular locality on any particular day - rainfall, temperature, humidity and so on - and its development can vary wildly with small changes in a few of these variables. Weather can be described as chaotic since a look forward depends on the starting conditions, i.e. it is a dynamic system, and the errors in the starting conditions will diverge the forecast. Climate is the description of the average weather we might expect at a given time (compare summer with winter), usually taken over a 30 year period to average out year to year variability perhaps due to a particularly hot summer or very cold winter. So, we know for instance that it is warmer in Southern Italy than UK, or wetter in a rain forest than in a desert; that is *climate*, but on a specific day, the *weather* may be hotter in London than in Rome. Compare again summer with winter. The average conditions in one or other can clearly be predicted.

**Heat Balance of our Climate**

Climate is determined by conservation of energy and the Stefan-Boltzmann radiation law. If energy conservation is changed by modifying the properties of the greenhouse gas layer, then Climate will change by consequence. The absorption of infrared radiation by $CO_2$ is an experimentally determined and proven fact that has been known for over a century. In a paper published in 1896 the Swedish scientist Arrhenius discussed the mean temperature of the ground being influenced by the presence of heat-absorbing gases in the atmosphere. Today known spectral properties of $CO_2$ and other greenhouse gas molecules in the atmosphere allow a relatively accurate estimate of how these increased atmospheric concentrations affect the radiation budget of the earth system.

The heat balance of our planet is in reality not much different from the heat balances around a process plant. All we have to do is work out the inputs and outputs, examine any changes, and input these to our climate models.

**Effects of Global Warming**

A look around the world shows us that something is going on with the climate. The environment surrounding our Earth is controlled by energy. On a global scale energy flows girdle the planet, from equator to pole, above water with jet stream winds, and in water with ocean currents. If we increase the energy levels through global warming, we will necessarily see changes to the climate, as well as increased events from energy releases. The obvious consequences will be increased global temperature levels, and changing weather, with larger energy releases in storms. Jet streams may change direction, so we may not see uniform warming, but we will see extremes.

**How is Climate Predicted?**

The basic tool used in climate prediction is a computer model of the earth's surface and the processes at work. Today there are a number of highly sophisticated models around the world predicting climate change. The most sophisticated of them is reputed to be at the Hadley Centre in England[5]. The Hadley Model contains more than ten million lines of computer code, and uses one of the world's largest super computers to run it.

At the heart of climate models and weather forecasts lie the Navier-Stokes equations (chemical engineers will remember Stokes Law used in fluid dynamics), which are a set of differential equations which allow us to model the dynamics of the atmosphere as a continuous compressible fluid. By transforming the equations into a rotating frame of reference in spherical coordinates (the Earth), we arrive at the basic equations of motion for a "parcel" of air in each of the north-south, east-west, and vertical directions. The equations are solved on a 3D lattice of grid points which scatter the globe. To this we add in dynamic models of the ocean, making a "coupled model". To this are added in experimental measurements in the real atmosphere, ocean etc. The question is often asked, how can we be sure that the models are reliable? One source of confidence comes from the fact that model fundamentals are based on established physical laws, such as conservation of mass, energy and momentum, along with a wealth of observations. The models are indeed checked; three of the main validation techniques are:

- Comparison against recent change - observations of climate from numerous sites around the globe are available from recent decades whilst some individual records such as the Central England Temperature go back several centuries;

- Comparison against observed climate variability - the climate is naturally variable from day to day, month to month, year to year and over longer timescales. Occasionally this leads to extremes of temperature or precipitation, so an important test of a climate model is whether it can credibly reproduce such variability;
- Comparison against past climate - climate models can be used to simulate climates of the more distant past, such as the last glacial maximum (the peak of the last Ice Age around 21,000 BC). Model results are compared with evidence of past change, such as tree-ring growth or the thickness of sediment layers in core samples.

Validation exercises such as these provide compelling evidence that, at least in terms of gross temperature response, the model is effectively reproducing what has been observed, and this gives us confidence that the models are adequate tools for the prediction of future climates. Taking mid-range $CO_2$ emissions, the Hadley model projects:

- a global mean temperature rise of 3 °C by the end of this century;
- a global increase in rainfall by 3.5%;
- an increase in European temperatures of around 4.5 °C;
- an increase in European rainfall of around 4%, much of it predicted for northern areas.

The predicted change in surface temperature for the period 2070-2100, compared with 1960-1990, is shown alongside in Figure 3.

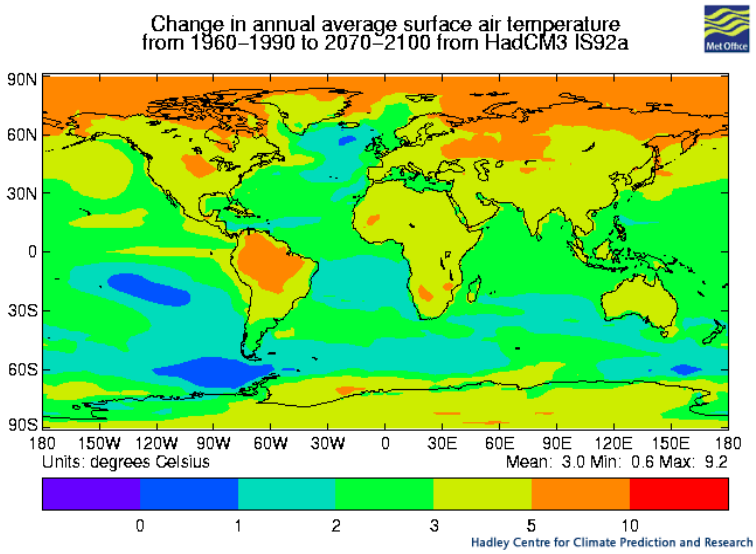



*Figure 3 Predictions of Future Climate*

**Sceptics**

If you cannot agree with the facts of Climate Change, you are not alone, as many people believe that global warming is a fiction. Although the world's scientific community has a virtual consensus, anyone relying on the media might get a different impression, namely that the conclusions of the scientific community are still disputed, or regularly called into question. Those who are sceptical to Global Warming question the data base (i.e. is $CO_2$ rising, is global temperature rising?), the link between Global Warming and rising levels of $CO_2$, and mostly blame natural phenomena, such as the sun. They also say that climate is chaotic (confusing climate with weather). There are a significant and vocal number of sceptics in the hydrocarbon industries in USA, who refuse to believe in the science. However, a scientifically credible and peer accepted alternative (sceptic's) explanation for the existence of Global Warming has yet to be published. As I write this in June 2009, one recent letter writer to the "Oil & Gas Journal" claims the case for Global Warming is based on "junk science", and that the temperature changes we are seeing are "not related to man"[6]. Convincing sceptics will continue to be an uphill battle.

So now we have the facts about climate change. We know the causes, and the effects (as reported very well by the media), so it is time to move onto how we address the problem, and then into solutions.

**Public and Political Attitudes**

Saving the environment is often the last thing on our mind during financial turmoil like we are seeing at present. Public education is crucial to triggering behavioural change, but mustering a sense of urgency is difficult when the threat is abstract or slow-moving. Opinion poll data show high levels of awareness but no sign of behavioural shift apart from switching of light bulbs and small steps in recycling.

Our politicians, seemingly by design, have a great culture for avoiding painful issues. The figures issued by Her Majesty's Government[7] show that UK Greenhouse Emissions have been falling since the 1990's (by 15% in the period 1990 - 2003). However, the figures exclude aviation, shipping and imported goods, which means that whilst our aviation and shipping industries have grown fast, and while a lot of our manufacturing has moved to China, the carbon cost from these have been overlooked, despite our consumption increasing. When we include these aviation and shipping figures, and look on the numbers on a consumption basis (i.e. GDP), we find that emissions have risen 18%[8].

**Economics of Global Warming - Stern Report**[9]

To quote the start of the report, *"The scientific evidence is now overwhelming: climate change presents very serious global risks, and it demands an urgent global response. This independent Review was commissioned by the Chancellor of the Exchequer, reporting to both the Chancellor and to the Prime Minister, as a contribution to assessing the evidence and building understanding of the economics of climate change."*

The Stern Report is an excellent place to start for our look forward. To quote again *"No-one can predict the consequences of climate change with complete certainty; but we now know enough to understand the risks. Mitigation - taking strong action to reduce emissions - must be viewed as an investment, a cost incurred now and in the coming few decades to avoid the risks of very severe consequences in the future. If these investments are made wisely, the costs will be manageable, and there will be a wide range of opportunities for growth and development along the way. For this to work well, policy must promote sound market signals, overcome market failures and have equity and risk mitigation at its core"*.

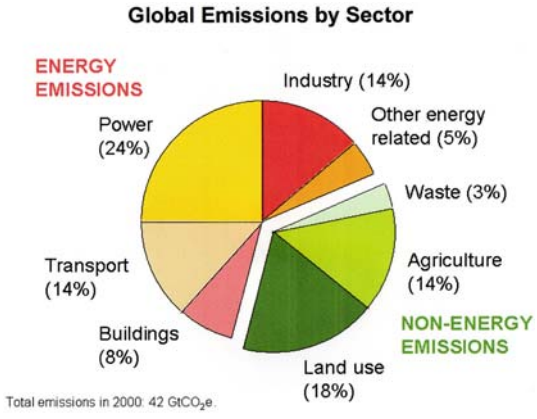
Any successful program of action on climate change must support two objectives—stabilising the concentration of atmospheric greenhouse gases (GHGs) *and* maintaining economic growth. Research by the McKinsey Global Institute and McKinsey's Climate Change Initiative finds that reconciling these two objectives means that "carbon productivity," the amount of GDP produced per unit of carbon equivalents ($CO_2e$) emitted, must increase dramatically.

To meet commonly discussed abatement paths, carbon productivity must increase from approximately $740 GDP per ton of $CO_2e$ today to $7,300 GDP per ton of $CO_2e$ by 2050—a tenfold increase. This is comparable in magnitude to the labour productivity increases of the Industrial Revolution. However, the "carbon revolution" must be achieved in one-third of the time that economic transformation took in the Industrial Revolution if we are to maintain current growth levels while keeping $CO_2e$ levels below 500 parts per million by volume (ppmv), a level that many experts believe is the maximum that can be allowed without significant risks to the climate[10].

To put this figure in perspective, if one were to view this spending as a form of insurance against potential damage due to climate change, it might be relevant to compare it to global spending on insurance, which was 3.3 percent of GDP in 2005. Borrowing could potentially finance many of the costs, thereby effectively limiting the impact on near-term GDP growth. In fact, depending on how new low-carbon infrastructure is financed, the transition to a low-carbon economy may increase annual GDP growth in some countries.

**Solutions**

*Figure 4 – Emissions by Source*




The majority of the world's emissions of carbon dioxide derive from power generation, industry, and transport (see Figure 4 – source World Resources Institute). Energy forecasters agree that fossil fuels are likely to remain the primary source of global energy demand for several decades. However the use of these fuels results in emissions of greenhouse gases, and in particular carbon dioxide. The world is therefore faced with the challenge of generating electricity with low carbon emissions, preparing and using fossil fuels in a more sustainable and efficient way, and evaluating and developing alternative sources of renewable energy.

Reducing Global Warming can only be accomplished through the development and deployment of a robust portfolio of solutions,

including significant increases in energy efficiency and conservation in the industrial, building, and transport sectors; increased reliance on renewable energy and potentially additional nuclear energy sources; and deployment of technologies, often new, to remove carbon from the environment. Slowing and stopping emissions growth from the energy sector will require transformational changes in the way the world generates and uses energy.

**Engineering Solutions**

The IEA said in their report commissioned by the 2005 G8 that we will need a "technology revolution", which would "completely transform the way we use and produce energy" [11]. The following summarises some of these technologies upon which our hopes are based.

**Carbon Capture and Storage (CCS)**

Roughly 60% of the $CO_2$ emissions from energy take place at large stationary sources, such as electric power plants, refineries, gas processing plants and industrial plants. Carbon Capture and Storage is a broad term that encompasses a number of technologies that can be used to capture $CO_2$ from these sources; compress it; transport it (mainly by pipeline) to suitable locations for the long term removal from our atmosphere. These locations include deep subsurface geological formations, deep saline aquifers, and depleting oil reservoirs (which can bring about enhanced oil recovery).

**Carbon Capture Technology**

The CCS process starts by capturing the $CO_2$ generated by power stations and large industrial processes (such as cement factories, steel works and oil refineries) before, during or after burning fossil fuels. Each of the three approaches to capturing the $CO_2$ produced from the use of fossil fuels, as well as the gas separation technologies, are well understood in terms of the basic science and the expertise needed to carry it out. The challenge lies in developing and deploying these processes cost-effectively on a sufficiently large scale, since most of the difficulties are financial.

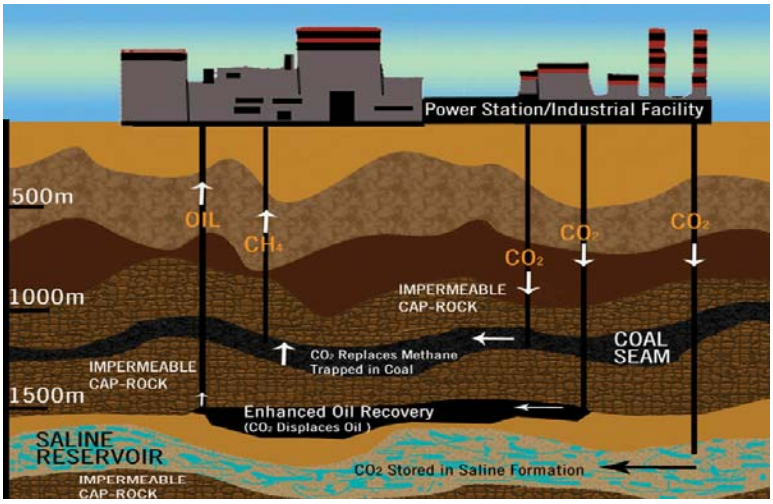
Most power plants and other large point sources use air-fired combustors, a process that exhausts $CO_2$ diluted with nitrogen. Flue gas from coal fired power plants contains 10-12% $CO_2$ by volume, while flue gas from natural gas combined cycle plants contains only 3-6 percent $CO_2$. It is generally estimated that the cost of capturing the $CO_2$ represents about 75% of the total cost of a carbon capture, storage, transport, and sequestration system.

The process of carbon capture and compression, requires high energy requirements and large capital investment, plus additional energy costs. The additional fuel cost for implementing carbon capture and compression can increase power generation costs by 25-30% for a coal fired power plant, and 15-20% for a natural gas fired power plant. Although some suitable technology exists, $CO_2$ capture has not yet been optimized for large-scale application. Extensive research is being undertaken in many countries around the world to study new, promising concepts and improve existing technologies with the purpose of reducing costs and energy consumed in capture. Simultaneously, tests are planned in power plants to validate these newer technologies on a commercial scale.

Several innovative schemes have been proposed that could significantly reduce $CO_2$ capture costs, compared to conventional processes.

**The concept of $CO_2$ storage**

After capturing the $CO_2$ from industrial processes it must be stored safely and securely away from the atmosphere. There are a variety of rock formations that act as secure, natural traps, holding gases and liquids deep underground both on land and under the sea bed. Often located at depths of over 1km, these traps consist of layers of porous rock filled with oil, natural gas or very salty water - much like a solid sponge - overlain by a thick layer of impermeable rock, known as cap-rock. It




is this cap-rock that initially prevents the fluids in the rock's pores from making its way to the surface. $CO_2$ can be stored securely underground because when it is injected into the porous rock, the higher temperatures and pressures that act on it deep underground, mean that it becomes a "supercritical fluid", which is dense like a liquid, but flows like a gas.

*Figure 5 – $CO_2$ Storage*

**Transport**

In order to reduce our carbon emissions by half, we would need to commercialise technologies now deemed experimental or too expensive. Using hydrogen as an energy carrier requires key technology breakthroughs and decisive cost reduction in all domains of the energy chain (production, distribution, storage, fuel cells). Without this giant leap in technology, it is highly likely that liquid fuels will remain the main source of energy for transport for the next 50 years. While a range of biofuels can be produced, the main satisfier of demand will continue to be based on gasoline and diesel, which will be blended with ethanol (from fermentation) and bio-diesel. However, the case remains unclear for bio-fuels, with present arguments over food vs. fuel, water availability priorities, and net energy requirements for biofuels production. It will be extremely difficult to expand current ethanol production with present technologies, and the second generation process (from cellulose rather than corn based) is still in development, with only a handful of companies actually developing the pilot plant for the process. Bio-Diesel faces similar problems, and both fuels face commercial difficulties, since bio-fuels are significantly more expensive to develop and produce than oil based products. Indeed, at the present time the amount of energy used to produce bio-fuels is not far off the energy you will get out of using it, which is hardly a formula for long term success.

**Alternate Energies**

There are many exciting potential sources of renewable energy under development. An example was given in Issue 17 of The Swordsman, which contained an article by Don Lennard on OTEC (Ocean Thermal Energy Conversion). The basis of OTEC is to use the extraction of energy from the temperature difference between the warm surface waters of the oceans in tropical and sub-tropical areas, and the colder deep waters in those same areas. The key advantage with this technology is that it could contribute a base load to the world's energy supply.

**Future Key Engineering Developments**

Engineers have responsibility for development of many solutions surrounding climate change. Indeed, we should be looking on this situation as full of opportunities for us and our profession.

A key area for development by engineers is in energy (predominantly electricity) storage. An obvious one is with the development of clean fuel technology which will require giant leaps in battery systems for individual transportation. A major step change is required with dynamic renewable energy (i.e. produced from dynamic sources, including wind, wave, tide, etc), and whilst these natural phenomena contain enormous amounts of energy, we require some means of trapping and holding it, since we don't have adequate ways of storing electrical energy. The opportunity for really effective large scale energy storage is a major challenge.

Alternate energy sources will receive massive focus, particularly to identify and use feedstocks which are renewable rather than depleting.

Carbon Capture and Storage requires development of a classical engineering problem; the separation of carbon dioxide at power plants and the development of a cost effective means of implementing the process.

The production of biofuels again is an opportunity for engineering, and targeting fuel from biomass the main challenge.

One final point. According to the BP Statistical Review of Wold Energy, June 2009[12], generally recognised as the best available source of such information, we rely today on fossil fuels for approximately 88% of our energy consumption. If the combustion of fossil fuels is indeed killing our planet, we engineers need to get our act together pretty fast to promote alternate sustainable sources of energy.

**References:**

(1) The IPCC can be seen at http://www.ipcc.ch/ and their final report can be seen on http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf
(2) http://royalsociety.org/displaypagedoc.asp?id=13619
(3) National Oceanic and Atmospheric Administration's Climate Monitoring and Diagnostics Laboratory http://www.esrl.noaa.gov/gmd/ccgg/trends/co2_data_mlo.html
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(5) http://www.metoffice.gov.uk/corporate/pressoffice/anniversary/hadley.html
(6) Letter to Oil & Gas Journal, May 18th 2009, by Larry Haverly
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(8) Too Good To Be True? The UK's Climate Change Record. Dieter Helm, New College, Oxford http://www.dieterhelm.co.uk/publications/Carbon_record_2007.pdf
(9) http://www.hm-treasury.gov.uk/stern_review_report.htm
(10) McKinsey Global Institute "The Carbon Producing Challenge" June 2008
(11) International Energy Agency "Energy Technology Perspectives 2008"
(12) The BP Statistical Review of World Energy 2009 can be downloaded from http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622

**Further Reading from the Internet**

- Basics of Climate Change a whole library of information at http://www.metoffice.gov.uk/publications/brochures/. I recommend "Climate change and the greenhouse effect".
- Facts and fictions about climate change, by the Royal Society, http://royalsociety.org/downloaddoc.asp?id=1630
- Frequently Asked Questions about the science of Climate Change (from the IPCC), http://ipcc-wg1.ucar.edu/wg1/FAQ/wg1_faqIndex.html

## Postscript

As mentioned at the beginning of this overview, there are many conflicting opinions concerning Global Warming and Climate Change. If anyone wants to follow-up with any point, or question, they can do so through the medium of The Swordsman, or in a personal e-mail to me, and I would be happy to respond to all points.

# PERSONALIA

***The Court Meeting on January 13th 2009 saw the largest number of new Liverymen being invested at one meeting for a very long time. There were nine in total and we welcome them all. Below are the CVs of some of our new Members.***

## Dr Richard Andrew Pike MA, PhD, FIMechE, FIChemE, FIET, FEI, FRSC.

Following a career with BP including time in the Shetlands and Far East and a period as Director General of the Institution of Mechanical Engineers Richard is now Chief Executive of the Royal Society of Chemistry

## Nicholas Jonathan Cullen BSc, MFEANI, MCIBSE.

Nick is a Graduate of the University of Bath having studied Building Environmental Engineering that

formed one part of the visionary multi-disciplinary department created by Professor Ted Happold. Nick recalls how it was Ted Happolds' description of his work on Vauxhall Cross that not only sold the idea of pursuing a career in building design and construction but also the merits of the combined Engineering and Architectural school.

Nick joined Hoare Lea Consulting Engineers and has been with them ever since, progressing to Partner and Head of Research and Development in 2004. In a world where careers often include spells with many companies, Nick attributes his long stay down to the variety of opportunities that have been available to him. In addition to work being varied and challenging the opportunity to travel and experience other cultures has been a significant part of his Professional life with periods in North and South America, Europe, the Middle East and China. Nick's projects across the world have related to building physics, building ventilation, low carbon strategies and technologies novel engineering concepts as well as UK and pan-European R&D projects. As head of R&D within the firm Nick is responsible for ensuring that the practice is aware of both the latest technologies and strategic thinking. As one of the leading UK Consulting Engineering practices, the firm has been at the forefront of addressing the challenges of Climate. As a Partner, Nick regularly delivers papers at national and international conferences. Nick has been responsible for a number of Industry guides published by both the British Council for Offices (BCO) and the Chartered Institute of Building Services Engineers (CIBSE), including guides to the use of biomass and the impact of regulation. Commercially Nick has been responsible for the development of a Sustainability group which has grown to 12 Engineers within 4 years. Nick is a member of the United Kingdom Building Regulations Advisory Committee (BRAC), BSRIA Council, the CIBSE Policy and Consultations Committee and the British Council for Offices Environmental Sustainability Committee and is also a part-time Lecturer at the University of Bath.

He is the author of numerous papers delivered to both clients and conferences and is the co-author of the 'Guide to Green Incentives', British Council of Offices (2003, 2008) and the BCO Best Practice Guide to Environmental Management in Offices (2006) and the CIBSE guide to UK Carbon Policy and Legislation (2008).

## Dr Michael Brian Inkson CEng, PhD, MIChemE, FEI.

Mike studied chemical engineering at Manchester, eventually receiving his doctorate in 1972 and joining Tate and Lyle in its R&D department. He has stayed in the sugar industry ever since.

The 1973 oil crisis established renewables such as sucrose as feedstocks for both liquid fuel and a

carbohydrate chemical industry. His initial role in T&L was to assist the researchers in understanding scale up and it was not long before he was responsible for establishing a multipurpose pilot plant facility and engineering the first pilot plants to go into it.

In 1975 he was appointed to run the pilot plant, by then operating a three shift system with about 50 employees. However, within a year the group had voted to commercialise two of the R&D departments and he was asked to become the Technical Director of the company set up for that purpose. Much of the following four years was spent engineering, procuring and constructing a greenfield plant on Merseyside: his first experience of large scale project management on the client side.

Once the project was complete, he requested a secondment to Triangle, a cane sugar factory in the remote low veldt of what was just becoming Zimbabwe. In his two years there he managed the factory expansion, started to learn the practical problems of sugar production and met Win, his wife of 25 years.

From Zimbabwe they went south to Durban where he ran the local T&L Engineering office. TLE provided engineering and project management as a contractor to both internal group companies and to external clients. The Durban office covered the Southern African and Indian Ocean region although projects stretched as far north as Kenya. From Durban he was posted to Miami to undertake a similar role there before returning to the UK to run all of TLE's worldwide operations.

In 1992 he left T&L in order to establish his own engineering company, still with the sugar industry as a focus. Its activities, in fibrous fuel cogeneration energy – a major feature of the sugarcane industry – and sugar process and project engineering reflect Mike's special interests: a very happy position to be in.

Mike and Win live on the very south east outskirts of London where he enjoys gardening when work allows: he spends many nights a year away from home as his chosen industry is distant from the UK.

## Professor Richard Jonathan Parker FREng, FIMechE, FRAeS.

Richard (Ric) Parker was appointed Director of Research & Technology, Rolls-Royce plc in January 2001, and is based in Derby, United Kingdom. He is responsible for direction and co-ordination of Research & Technology programmes across all the Rolls-Royce businesses.

Ric is Chairman of the SBAC, Engineering and Technology Board, and Chairman of the UK Aerospace Technology Steering Group, a member of the NDIC R&D Group and a member of the European Transport Advisory Group.

Ric joined Rolls-Royce in 1978, and has held various posts including Chief of Composites and Ceramics, Chief of Compressor Engineering, Managing Director - Compressor Systems and Director of Engineering & Technology, Civil Aerospace.

Ric gained a BSc in Physics at Imperial College, London in 1975 and an MBA with distinction at Loughborough University in 1992. He is a visiting Professor in Aerospace and Transport Technology at Loughborough University.

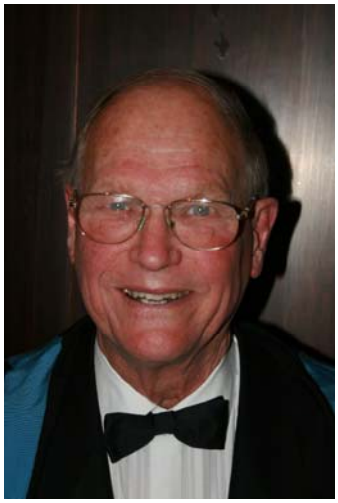
Ric's basic training was in Physics and Optical Sciences. He joined Rolls-Royce after a brief spell with the National Physical Laboratory, in Teddington, where he worked on application of novel holographic recording materials using thermoplastics and xerography. On joining Rolls-Royce he worked on a number of laser-based measurement techniques, specialising in applying these techniques in the adverse environments surrounding aero-engine testing. He went on to lead a number of engineering areas including advanced materials (composites and ceramics) and compressor design.

Ric was born in Scunthorpe, North Lincolnshire and is now married to Jeanette, has two daughters, and lives in Littleover, Derby.

## Professor Keith William Arthur Guy BSc, PhD, FCGI, FIChemE, DIC, CEng, CSci, CEnv.

I went up to Imperial in 1962 and stayed and stayed. In 1966 I became Chairman of the Entertainments committee and had the great pleasure of putting on many of the top acts of the day, including Hendrix's last concert at the Albert Hall. I eventually decided (1970) to get an honest job and stop trying to promote the house band, "Smile", which featured Brian May and Roger Taylor. One year later they became "Queen" and I settled into my chosen career with a small American company called Air Products. This apparent lack of insight has provided a source of self-ridicule in many after-dinner speeches to student societies, but I still think I made the right decision. I was lucky in my choice of companies, my abilities were valued and my faults underplayed. I had several good mentors and enjoyed many roles in the engineering division, including a number of years as General Manager of Engineering. My wife tells me that my career has always been dominated by my dislike of predictable and regular activities. Engineering groups tend to go through cycles of challenge and solution, of team building to high competence and losing the stars to other roles. So I left engineering to run marketing and when that too became predictable moved on to business development director. One of the joys of my time with Air Products was their encouragement to stay in contact with universities, for both technology and recruitment, and to play a full part in institutional activities for networking. I chaired various EPSRC committees and was on the council of the IChemE for more than 20 years. I was lucky to be made a fellow of the Royal Academy of Engineering at a reasonable early age and have been active on many of their committees too. The last seven years of my time with Air Products saw the clean air legislation forcing oil refineries to remove sulphur from most of their products and I developed an expertise in production and marketing of large volumes of hydrogen primarily for sale to oil companies. This developed into an interest in the hydrogen economy and fifteen years later I am still writing articles about it. I left Air Products after 28 years to start an industrial gas consultancy business. The last ten years have been wonderfully unpredictable, advising major companies about industrial gases, advising industrial gas companies about their customers' needs; but best of all becoming a visiting professor at my alma mater, Imperial College and chairing a number of university spin-off companies through their early years. No two days are ever the same and that's the way I like it'

## Robert Freer BSc, DIC, CEng, FICE, FIStructE, FEI, MIET.



An initial interest in hydraulics at Imperial College, encouraged by the late Prof Peter Wolf, led to my first job on a Scottish hydro-electric scheme, and subsequently on other power stations including nuclear, gas, diesel, coal, energy from waste and renewables. From this I developed a continuing interest in our national electricity system and the need to maintain a secure and reliable supply.

I have also worked on the development of innovative marine and structural projects including the Dubai dry docks and the European satellite launch structure in French Guiana.

I have written about 40 papers and technical articles, including a paper on the Three Gorges Project in China for which I was awarded the George Stephenson Gold Medal by the Institution of Civil Engineers, and I organised and led two technical missions to Europe and Japan under the DTI OSTEMS scheme.

I believe we need to do more to explain to the public and politicians the essential role of engineers in maintaining and developing our national infrastructure, preferably through some organisation which can speak on behalf of all disciplines in our sadly fragmented profession.

I am a Member of Council of the Institution of Civil Engineers, a former Chairman of the London Region and a Member of Council of the Parliamentary and Scientific Committee.

## Jan Charles Hugh Lewis BEng, CEng, FIMM.

I was born in Isleworth in 1969 next to Feltham Borstal. Due to my father's job in the Prison Service I subsequently moved house eight times before I was eighteen. I developed a love of the great outdoors whilst living on Dartmoor and wanted to understand the processes that formed the landscape. Whilst living in Keynsham I developed an interest in fossils, digging out 0.5m diameter limestone ammonites from sewer trenches. Construction site safety was a little lax in those days. The only career advice I got from my father was don't join the Prison Service! I have always loved engineering and when I discovered I could link engineering and geology in the form of the Engineering Geology and Geotechnics degree at Portsmouth, there was no looking back. Wardell Armstrong gave a talk during my final year and offered interviews to anyone who might be interested in joining them. I was recruited there and then and told to make contact after I had completed my planned summer of mountain leading in Scotland. The likely office location being either Stoke or Manchester.

On return from Scotland I had three days to find out where Stoke was and report for duty. My degree was part mining and part civil engineering. Wardell Armstrong consultancy services included those disciplines and so both career options were open to me.

After initially analysing runs of mine data for existing coal mines in Poland to predict future recovery rates, I became more involved in UK geotechnical projects. I was later based in West Bromwich before relocating again to set up a London office. I am a Board Director of Wardell Armstrong. During my career at Wardell Armstrong I have been involved in a wide variety of engineering, geological, geotechnical, environmental and mining projects. My work has included the research, design, supervision and analysis of desk studies and site investigations for sites with geological, geotechnical, mining, hydro geological, contamination and landfill gas problems. Projects have involved the design, specification, procurement and supervision of works connected with the controlled compaction of engineering fill materials, passive venting of landfill gasses, controlled burial of landfill waste, location and stabilisation of abandoned mine workings, brownfield site reclamation, building demolition, foundation engineering, ground improvement and the remediation of contaminated soil and groundwater. I have undertaken the detailed assessment and reporting of technical data (including acting as expert witness) for legal disputes and planning inquires involving ground subsidence, soil contamination, groundwater contamination and foundation design. Recent projects have included due diligence on a diamond mine in Lesotho, investigation of heave damage to housing, groundwater remediation of petrol contamination and the redevelopment of a former hospital for 500 houses.

I am a supporter of Institutional activities at national and local levels and keen to encourage young people into engineering. I was a National Councillor with the IMMM from 2002 to 2008 and am currently a Vice President. I have been a Councillor of MinSouth (the local IMMM branch) since 1999. I am currently the Honorary Treasurer and a Past President of MinSouth. I regularly undertake CEng and Professional Interviews on behalf of the IMMM.

Julia and I have two children, Claudia (12) and Stan (10). We are an active family enjoying walking, cycling, tennis and mountaineering. Golf however is restricted to Stan and me.

## Eur Ing Anthony George Willenbruch MS, CEng, FIMechE, FCMI.

Tony Willenbruch has a wide portfolio of experience gained from 35 years as an Engineer Officer in the Royal Air Force and a long personal involvement with professional engineering and management institutions. Founded on the broad academic base of his MA in Natural Sciences (Materials Science & Metallurgy) from Cambridge and a postgraduate diploma in Aerosystems Engineering from Loughborough, Tony's

RAF career embraced senior appointments in aircraft and component maintenance management from flight line to depot level, directing the Advanced Systems Engineering MSc course, personnel selection, procurement and in-service support management (particularly for guided weapons), policy on engineer branch entry requirements and defence against chemical, biological, radiological, nuclear weapons and ballistic missiles, Middle East defence sales and as logistics branch chief in a NATO Air Headquarters. His last military role was in direct support to Director General (Research & Technology) within the MoD Chief Scientific Adviser's business area.

On retiring from the RAF in 2006, Tony spent a year as chief executive of the Institute of Wood Science and the Institute of Carpenters before joining the Technology Strategy Board's Aerospace & Defence Knowledge Transfer Network as Operations Manager with a particular, but not exclusive, focus on defence. He has recently moved on to become the Society of British Aerospace Companies (SBAC) Senior Manager – Engineering & Technology Strategy and deputy Director for Civil Air Transport.

Tony is a Chartered Engineer and Fellow of the Institution of Mechanical Engineers, a Fellow of the Chartered Management Institute, a Fellow of the Royal Society of Arts and a Member of the Royal Aeronautical Society. In addition to now being a Liveryman of the Worshipful Company of Engineers, he is a Freeman of the Guild of Educators for whom he is taking a lead on educational links with the Armed Forces and Cadet Organisations. Tony remains actively involved in Cambridge affairs through his long-term role as Vice-Chairman of the Sidney Sussex Society and he is also a member of the Court of Imperial College. Well involved in London-based Clubs and charitable organisations, Tony is single, has lived for many years in Kingston on Thames and includes among his other interests walking, travel, history, architecture, music, heraldry and genealogy – the latter focused particularly on his 18th Century family origins in northern Germany.

## David Michael Gerald Knight BSC, BEng, CEng, FIET.

I was brought up and schooled in Cambridge, in later years at The Cambridge Grammar School. Much to my headmaster's dismay when leaving school I felt that I needed a break from Cambridge and attended University further afield.

I read Electronic Engineering at Southampton. I was on a 'thick-sandwich' course so spent a year in industry prior to starting my degree, and returned each summer vacation. Initially this was with the TI Group (aka Tube Investments), and latterly with British Aerospace.

After graduating I travelled in Australia and New Zealand for seven months, which was a great experience. On my return I immediately started work at British Aerospace where I worked on a cargo surveillance project - essentially large scale X-ray imaging of cargo containers combined with sophisticated gas analysis for the detection of drugs, explosives etc.

I thoroughly enjoyed my work at BAe, but was unsure where my career was going. At about this time a firm of solicitors advertised in the *IEE News* for engineers to join them. Intrigued to find out what an engineer could do working for a firm of solicitors, I responded and was introduced to the world of patents and patent disputes. As the technology is at the heart of a patent dispute they wished to have technically competent people as part of their team. Although it was a step into the unknown I accepted the post, and had the good fortune to find a career which I find thoroughly stimulating and enjoyable.

Subsequently I spent two years studying at the College of Law and in due course also qualified as a solicitor. Although my entrée to the legal profession was patents, my practice since has expanded to include trade marks, copyright (particularly in the IT field) and designs, but the primary focus remains advising clients on patents and related issues. I am a partner at Field Fisher Waterhouse in the City.

I am a Fellow of the IET and former Chairman of the Surrey Branch.

I live in Guildford with my wife and three children (1 girl, 2 boys) aged 16, 15 & 9. In the winter months much of my free time is taken up with rugby. I assist in coaching my son's age group, and twice a year organise a rugby festival for 1,500 children.

Occasionally I like to pretend that I am younger than my years and have a game myself.

***At The Court Meeting on March 3rd 2009 three more new Liverymen were invested. We also welcome them.***

## Iain Robert Sturrock MBE, CDipAF, CEng, FIET

Iain was born and brought up in Dundee and graduated in Applied Physics from Napier University in Edinburgh. He has had a varied career, mostly in telecommunications and IT. The early part included medical physics, university research and a short career commission in the Royal Navy, (when he commanded a 'Green Goddess' detachment in London during the 1977 fire-fighters' strike.)

During his telecoms career, he worked for manufacturers and service providers in a variety of technical and management roles. He was in Nortel's leadership team for a global ERP rollout. He also has experience as a management consultant. More recently he was Head of Programme Management Office for BOC/Linde and PMO Director for Birds Eye, where he led the very successful extraction of Birds Eye from Unilever's IT systems.

He has served on committees and boards of engineering institutions since 1978, most recently as Vice President of IET until October 2008. He was awarded an MBE in the 2003 for services to business and engineering. An occasional conference speaker, he gave the keynote address at ComTech 2 in Glasgow. Iain is Chair of Governors of Bisham CE School and lives in Maidenhead with his wife and family.

## David Alan Cooper BSc(Hons), MSc, FRSA, FIET, FCIBSE.

David Cooper is the Managing Director of UK based lift consultants LECS (UK) Ltd. He has been in the lift & escalator industry since 1980 and is a well known author and speaker. He holds a Master of Science Degree in Lift Engineering as well as a Bachelor of Science Honours degree, Higher National Certificate

and a Continuing Education Certificate in lift and escalator engineering. He is a co-author of "*The Elevator & Escalator Micropedia*" (1997 & 2009) and "*Elevator & Escalator Accident Investigation & Litigation"*. (2002 & 2005) as well as being a

contributor to a number of other books including CIBSE Guide D. He is a regular columnist in trade journals worldwide including Elevation, Elevator World and Elevatori. In 2007 he appeared on the BBC3 TV programme "Emergency Measures" with respect to accidents involving lifts. He has presented at a number of industry seminars worldwide including 2008 Elevcon (Thessaloniki), 2008 NAVTP (San Francisco),1999 LESA (Melbourne), 1999 CIBSE (Hong Kong), 1999 IAEE (London), 1998 (Zurich), 1997 CIBSE (Hong Kong), 1996 (Barcelona) and 1993 (Vienna) as well as numerous presentations within the UK. He is also the founder of the ELEVATOR ACADEMY which provides free training for apprentices and trainees and is a trustee of the UK's Lift Industry Charity which assists industry members and/or their families after an accident at work.

## Keith Haverland Millard CEng, FIMechE, FIET.

Keith Millard began his engineering life as a seagoing marine engineer followed by a period as an operations engineer with the Central Electricity Generating Board. Since 1970 his career has been centred on consulting. Much of his early work was in the power sector and he has had some 30 years general management experience. For 11 years

he was Managing Director of Gilbert Associates, before becoming Business Development Director for Balfour Beatty Construction International and then a Vice President of Parsons International responsible for Europe, Africa and the Middle East. In 1998 he founded Kea Management advising clients on strategy development and providing a coaching and mentoring service to Chief Executives through Vistage International, which continues today. He received Vistage International's Robert Nourse award in 2006.

He is President Elect of the Institution of Mechanical Engineers and will take up the office of President in May 2009. He has been a member of the Institution since 1968. He currently Chairs the Technical Strategy Board and is a past Chairman of the Power Industries Division Board and founding Chairman of the Management Group Board. He has been a trustee since 2004.

Keith is a member of the Rotary Club of Woking District, a Past President and Paul Harris Fellow. He is a passionate skier although this rarely surfaces more than once a year, an occasional golfer and complete novice pianist.

***At the Court Meeting on 21st April another four new Liverymen were invested and are most welcome to the Company***

## Iain Cameron Conn BEng, FIChemE, FCGI

Iain Conn is a Fellow of the Institution of Chemical Engineers and a graduate of Imperial College.
He began a career with BP in 1986 in commercial refining and oil trading, through to becoming responsible for The Technology and Engineering function of BP in 2004, and is now the Group Managing Director of BP.

## Windsor Coles OBE, CEng, FIET

Following training in the mining industry and college associateship with the University of

Glamorgan, Windsor Coles was appointed as HM Principal Electrical Inspector of the Health and Safety Executive in 1975. He is a Fellow of the Institution of Engineering and Technology, and in retirement since 2000 he has been active as a consulting engineer for a range of national and international clients. Windsor is a Liveryman and a Member of the Court of Assistants of the Welsh Livery Guild.

In his earlier years, he played a great deal of rugby but now satisfies himself by watching rugby and walking over the hills of South Wales.

He lives in Pontypridd, South Wales with his partner Sue Hewerdine.

## Michael John Neale OBE, FREng, BSc(Hons), CEng, DIC, FIMechE, FCGI, FIDGTE

Michael Neale started his engineering career at the age of 16 as a shop floor engineering apprentice at Rolls Royce in Derby .He studied part time for an honours degree in engineering, which he obtained at the age of 21. This gave him a very valuable combination of the theory and practice of engineering. He then went

to Imperial College to do research in lubrication, and to compensate for the five years of lost social opportunity during his earlier studies. He was then invited to be the research manager at the Glacier Metal Co, who were then world leaders in plain bearing technology. He then moved on to run their customer technical advisory services. Four years later he set up an independent world wide consultancy, now Neale Consulting Engineers Ltd, specialising in Tribology and Mechanical Engineering. This has taken him and his colleagues all over the world solving major problems with machines and equipment of all kinds.

He is still the chairman of Neale Consulting Engineers Ltd. and is a Fellow of the Royal Academy of Engineering and a past president of the Institution of Mechanical Engineers. He is also currently the President of the Association of Consulting Scientists. He is also an active restorer of country houses and steam machinery.

## Alderman Michael David Bear BSc, MBA, CEng, FICE

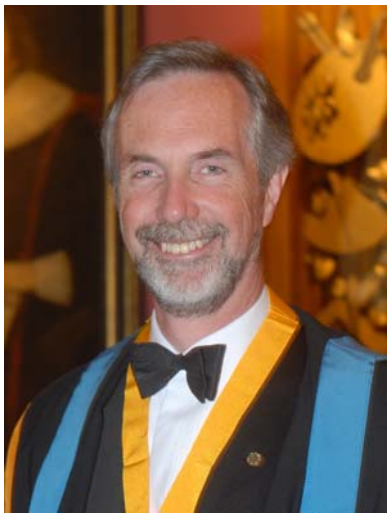
Michael Bear studied Civil Engineering in South Africa and an MBA at Cranfield University. He is a Fellow of the Institution of Civil Engineers and Fellow of the Royal Institute of Chartered Surveyors . He has had 34 years experience in international construction and property development industries and has worked in South Africa, Nigeria, Cameroon and China. Michael is presently the Managing Director of Balfour Beatty Property Ltd and the Regeneration Director – London Group – Hammerson plc. He served as Sheriff for the City of London in 2007/2008 and he has been successfully appraised by the Panel dealing with Aldermanic Progression. Alderman Bear is a Member of the Court of The Worshipful Company of Paviors, his mother Company, and of The Worshipful Company of Surveyors. His voluntary work includes charity projects in Africa, Bangladesh and throughout the UK.

He is a Director of CRASH, Spitalfields Market Community Trust, The Drinking Fountain Association and is a Governor of the Sir John Cass Foundation and Primary School, Thomas Coram Foundation for Children, Clifton College, KPMG Academy, the City Arts Trust and the London South Bank University. He served as Chairman of the public/private City Challenge Programme in the London Borough of Tower Hamlets and as a Director of its successor body, Cityside Regeneration. Married to Barbara who is a Freeman of the Musicians Company, a qualified teacher, musician, artist and therapist in Complementary Medicine. His leisure pursuits are international travel, scuba diving, tennis, opera and the theatre.

## NEW COURT ASSISTANTS

***At the AGM it was announced that Jean Venables OBE, Air Vice Marshal Graham Skinner CBE, Professor Andrew McNaughton and Rear Admiral Neil Latham CBE had been elected as Court Assistants and we congratulate them all.***

*Air Vice Marshal Graham Skinner OBE, RAF*



*Professor Andrew McNaughton FREng*

*Rear Admiral Neil Latham CBE*

***Jean Venables OBE***

# OBITUARIES

## ROBERT BRIAN DUNN FREng
## 1924 - 2008

Robert was born in Lancashire on 23 March 1924 into a family mostly engaged in coal mining over many generations. After school at Eccles Grammar School, he won a scholarship at the Wigan and District Mining and Technical College. This in turn led to higher education at Sheffield University where he gained a Bachelor degree in Mining Engineering.

His mining family background not only influenced his ultimate choice of career, but his leisure talents and interests too. His father played musical instruments and enjoyed singing opera. So it is not surprising that Robert was soon to be a choirboy in church, playing not only the piano but also the organ.

As well as being awarded a good degree at Sheffield University, he participated fully in the social life. His passion for playing jazz lead him to form his own swing band called Robert Dunn and the Swinging Senators - “Music for the Moderns”.

After practical experience in the collieries of John Brown in South Yorkshire he returned to Lancashire with Manchester Collieries Limited prior to Nationalisation in 1947. Subsequent experience took him to the post of Manager at Maypole Colliery in Abram which was then the largest colliery in the Wigan district.

The decline of the Lancashire coalfield, which was becoming evident due to exhaustion, prompted a move in 1951 to the London headquarters of the National Coal Board, working as a specialist Mining Engineer introducing new technology into the field of coal extraction. In 1954 he returned to the management of collieries, this time to the Scottish coalfields where ultimately he became Head of Mining.

The year 1967 saw another major reorganisation in the Coal Industry could not be balanced by an intensive

programme of new sinkings in selected coalfields. This resulted in a move to North Derbyshire, first as Deputy Director then Area Director before being appointed Director-General of Mining at the National Coal Board headquarters in London in 1973.

During this latter period he was founder Director of British Mining Consultants Limited and Chairman of Associated Mining Consultants, Canada.

In 1984 he returned to private industry where he was Chairman of British Mining Services Group and Senior Mining Consultant to the Wardell Armstrong partnership. He became President of the Association of Lancastrians in London in 1994.

He was a Fellow of the Royal Academy of Engineering, a Fellow of the British Institute of Management and was both a past President of the National Institution of Mining Engineers and the Southern Counties Region. He was a visiting Professor of Mining and Minerals at Leeds University and visiting Professor at Newcastle University. He served for many years on the Governing Body, Executive Committee of Imperial College London and was a member of Court at Cranfield University. .

Robert played a pivotal part in the formation of the Worshipful Company of Engineers and was very proud to be our third Master. He was enormously supportive of our Company attending Court meetings and social events right up to his death.

During his year as Master Robert was singularly successful in the task of recruitment, so much so that before the end of his Master's year the Company was hitting the limit of authorised membership. He organised a series of private intimate dinners where he pursued this objective, and made it his business to accept all possible invitations to dinners and speaking engagements, a policy followed by me during my Master's year.

Robert loved walking, particularly in Derbyshire and the Peak District with his wife Pauline or anywhere where there was a decent restaurant to rest and enjoy good food and wine. He was a regular visitor at his local pub 'putting the world to rights' and having jovial conversations over a "pint or two" with friends and old colleagues.

Robert Dunn died on 23 November 2008. His son Giles, also a qualified engineer, played the organ at his funeral, as Robert did at his father's funeral continuing the long line of music in the family.

*Andrew Jackson*

# DR DAVID S MITCHELL CBE 1930-2008

*A Memory by Richard Rooley*
*David's Senior Warden in 1998*

Whimsical, a dry sense of humour, a love of people and a passion to communicate characterised David who was Master from 1998-1999

*David at Cardiff in 2005*
*Camera always to hand*

At Rolls Royce, after work in the elite team producing nuclear powered engines, and a period as managing director of the Small Engines Division, he moved to London to manage the Sales team.

In technology, in management and in sales he communicated. He communicated with a light touch and smile but with authority.

In the Livery he set out to involve all members of the Company in what was happening and what was planned. He continued this drive after his period as Master by setting up the website and relaunching the Newsletter under the title "The Swordsman".

He progressively signed his E-mails as David the hack, David the Webster, David the cross-eyed, David the gratified in retirement, David the Webmaster emeritus, David the shadowy, David the fly poster, David the ageing one, David the anonymous, David your animated webmaster, David the perspiring webmaster, David the cryptographer.

David was also the loving husband of Winifred, father of Eric and Caroline and of their four grandchildren.

*David and Winifred*

Always turning a strong statement into a light request by his skill with words; all present at the Mansion House in 1996 will remember his toast to the guests in perfect rhyming and scanned verse.

His out of town meeting at Portmeirion marked the transition from Spartan to comfortable. The Livery responded, making it one of the most memorable and setting a benchmark for the future.

In his home Parish of Little Missenden, he demonstrated managerial skills as vice chairman of the PCC and chairman of finance. Quoting Revd David Hemsley at the memorial service, "He was both Martha and Mary; a Doer (practical and skilled in all things) and a listener (an inner strength and wisdom, vision, values, spirituality all bound up with humour).

*David's Painting of Little Missenden Church Altar*

We shall remember and cherish his gifts, but above all, the way he applied them with such a wonderful sense of humour.

## Rodney Thomas Beazley

*Peter and Cynthia Hammersley represented the Company at the funeral of Rodney Beazley who died in February and Peter writes below. Our condolences are extended to his wife Alma and his family.*

Rodney's goddaughter read a poem about fishing which recalled his and Alma's passion for the sport and his son, Stephen gave an eloquent Eulogy which covered his family, career, sporting and leisure interests. Rodney loved engineering and studied before and during the war at Northampton Engineering College which became part of City University. He was commissioned in the Royal Electrical and Mechanical Engineers, specialised in tank maintenance and became one of the few tank technologists. He worked for Rolls Royce, Meadows, where he designed diesel engines and for a number of other leading engineering companies becoming a world specialist in oil filtration. He finished his career with his own engineering development and consulting company the pinnacle of which was his fire isolating valve.

He ran cross country for his school, played rugby for the Royal Gloucester Hussars and the Saracens and was a very keen salmon and trout fisherman.

Rodney and Alma were staunch supporters of the Company from the early days (he became a Liveryman in October 1985) until the recent past. They will be greatly missed.

*Peter Hammersley*

## Professor John Mullin FREng

*I am also sorry to report the death of founding member Professor John Mullin FREng. John died in March at the age of 83 and was Emeritus Professor of Chemical Engineering at UCL.*

## WEDDINGS

Congratulations to Brian Cook and Tineke van Boheenem who were married on 7th March.

Brian told me that he joined Shell in 1955 and was very soon afterwards sent to Holland on a training course. There he met Tineke who he described as the prettiest girl in the Hague. However their paths diverged and they both enjoyed long and happy marriages to others. However in 2000 Brian's wife

died and so did Tineke's husband. By chance their paths crossed again and the rest as they say is history.

*Tineke and Brian Cook*

Congratulations also to Court Assistant David Johnson and Marilyn Wedgewood on their marriage at the end of February.

*David Johnson and Marilyn Wedgwood*

## WEDDING ANNIVERSARIES

Congratulations to Peter and Cynthia Hammersley on their Golden Wedding on 15th August 2009.

*Peter and Cynthia with the Master in July at the Welcombe Hotel where they spent their honeymoon (See Golf Report)*

Congratulations to Denis and Barbara Dickinson on their Diamond Wedding on 30th July 2009.

*Denis and Barbara Dickenson in Cardiff in 2004*

## MEMBER'S NEWS

*In the annual Awards of the Association for Consultancy and Engineering Liveryman David Cooper's firm picked up an Highly Commended Status for their work on the refurbishment of the Babbacombe Heritage Cliff Railway in Devon.*

The refurbishment provided improved accessibility, reduced power consumption and increased reliability and safety and achieved up to date statutory compliance whilst maintaining the historic ambience.

The work included providing new cars, relaying the sleepers and the tracks as well as overhauling the gearboxes and control systems.

*TV Host Nicky Campbell presenting the Award to David Pickering, Assoc Director in charge of the Project with Lawrence Hughes, ACE Vice Chairman*