



*Hazards forum*



# The Hazards Forum Newsletter

Issue No. 79  
Summer 2013

Web version

# Hazards Forum Newsletter

## Issue No. 79 - Summer 2013

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***Edited by Dr. Neil Carhart***

***Views expressed are those of the authors, not necessarily of the Hazards Forum***

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Hazards Forum Executive Secretary: *Brian Neale*

*June 2013*

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# Hazards Forum AGM 2013

Brian Neale and Neil Carhart

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The Hazards Forum Annual General Meeting was held on Tuesday 19<sup>th</sup> of March at the Institution of Civil Engineers, One Great George Street, Westminster, London, SW1P 3AA. The meeting began at 16:30, and was chaired by the Hazards Forum Chairman, Rear Admiral (retd.) Paul Thomas CB FREng.

The Chairman welcomed all those in attendance and reported the apologies for absence received from those members who could not attend, including Sir David Davies. He mentioned in his welcome new members to the Hazards Forum and Dr Neil Carhart, who became the new editor of the Hazards Forum Newsletter during 2012.

R/Adm Thomas highlighted the availability at the meeting of the 2012 Annual Report of the Trustees, along with the Notes of the previous year's AGM. Having established the approval and acceptance of the previous year's notes, the Chairman turned to the Annual Report of the Trustees 2012.

Two members of the Executive Committee are reviewing the Hazards Forum's Objectives, to ensure that they remain appropriate and compatible with the Forum's status as a charity and the needs of its members.

Discussing the Executive Committee for the coming year, the Chairman announced that Professor Richard Taylor would be moving on from his position as a co-opted member for two years and six years as a Trustee prior to that. In his absence, he was formally thanked for his significant contributions in those roles. At the 2013 AGM one of the five Trustees, R/Adm Thomas, has completed his first three-year term. Being eligible to stand for a second three-year term, R/Adm Thomas

indicated that he was standing with the support of the Executive Committee. No other nominations had been received and his nomination to remain in the position was ratified by the AGM, thus marking the start of his second three year term as a Trustee. The AGM welcomed this and also his willingness to continue as Hf Chairman for a second period. John Armstrong was welcomed as a new co-opted member of the Executive Committee.

The Chairman then discussed the year's evening events, reporting the high levels of support and attendance they received, including the participants, professional institutions and corporate sponsors. The first event of the year looked at *A resilient transport infrastructure for a world event: From planning to implementation – the 2012 Games*. The next three events formed a mini-series discussing the meaningful communication of risks and hazards. The first of the series examined the latest theories on *Improving our Understanding of Public Concerns about Risk*, the second looked at *Improving our Understanding of Risk Communication* from an industrial perspective, while the third looked to *Risk communication - the future*.

The AGM turned to matters concerning communication and publicity. The Chairman reported on the valuable role of the Hazards Forum website in the promotion of the Forum's aims, evening events and Newsletters as well some events by others in the "risk family of organisations". The Newsletter is made available in both a printed hard-copy and digital form. The electronic version is now the preferred format amongst members and has been confirmed to add value for member bodies, though the printed copies remain useful for placement in particular

areas such as libraries. The Hazards Forum now sends hardcopies of the Newsletter to the British Library for their archives. The Chairman thanked the Newsletter's editors, and all those who contributed to it over the course of the previous year.

The Forum, through the Executive Committee and Secretariat, continues to engage proactively with sponsoring organisations and members. As a result membership levels have improved during the year following a previous small decline attributed, in some cases, to the economic down-turn.

R/Adm Thomas then discussed the Hazards Forum financial accounts. The Forum continues its policy of maintaining a reserve roughly equivalent to one year's turnover as insurance against a sudden loss of income. The accounts for this year indicate that the Forum has successfully implemented this plan, and a small surplus

has been achieved. This mainly results from an increase in the financial sponsorship of the evening events combined with a small increase in subscriptions. He thanked Sandy Bierrum, the examiner of the accounts for his work and for his confirming that he is content to sign the accounts in the Annual Report for 2012. The Chairman continued by thanking the Executive Committee, Executive Secretary Brian Neale, Tim Fuller the Secretariat Office Administrator and Janet Homer the Accounting Technician for their hard work and commitment during the previous year.

As no other business was raised during the meeting, the Chairman once again thanked those in attendance, and highlighted that the next meeting has been proposed for Tuesday 18<sup>th</sup> March 2014 at the same venue.

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## New member of the Executive Committee

### **John Armstrong MEng CEng FIMechE**

Head of Corporate Safety and Asset Risk - E.ON UK



As from the AGM on 19<sup>th</sup> March 2013, the Hazards Forum is pleased to welcome John to the Executive Committee as a Co-opted Member.

John has over 10 years of experience working as an engineer in the energy sector. John has an MEng in Mechanical Engineering from the University of Birmingham and is due to graduate from a Global Energy MBA from Warwick Business School in July this year. John initially worked in plant design for onshore oil and gas facilities and then moved into broader engineering and safety roles in the utility sector.

John is a Chartered Engineer and a Fellow of the IMechE. He is a member of the Energy Institute Power Utility Committee, IMechE Process Board and Oil, Gas & Chemicals committee.

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## The Hazards Forum Executive Committee

The Hazards Forum Executive Committee is responsible for the management, finances, policies and overall direction of operation of the Forum. Following the 2013 Annual General Meeting, the members of the current Executive Committee are:

Chairman: **Rear Admiral (retd) Paul Thomas** CB FREng FCGI CEng FIMechE HonFNucl HonFSaRS

**Mr Brian Wimpenny** CEng FIMechE

**Mr Dave Fargie** CEng FICChemE

**Dr Luise Vassie** MInstP CFIOSH

**Mr Andrew Petrie** CEng MIChemE MIET CMIOSH

**Prof Sue Cox** OBE CCIM FBAM FRSA FRSH MIOSH

**Mr Ian Wright** CEng MICE MIStructE FCIArb QDR Barrister at Law

**Mr John Armstrong** CEng FIMechE

**Prof William Bardo** FREng HonFInstMC FIET FInstP FPhysSoc (**RAEng Observer**)

**Lord Julian Hunt** FRS HonFICE FIMA FRMetSoc (**Royal Society Observer**)

**Mrs Jane Willis** (**HSE Observer**)

Secretary: **Mr Brian Neale** CEng FICE FIStructE HonFIDE

More information about the structure and mission of the Hazards Forum can be found on the Forum's website: [www.hazardsforum.org.uk](http://www.hazardsforum.org.uk)

The website also contains a great deal of useful information on the benefits of becoming a member of the Hazards Forum along with details on how to become a member, interesting articles, a calendar of events and previous issues of the Hazards Forum Newsletter.

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## The Hazards Forum is tweeting!

John Armstrong

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Twitter enables us to update members and friends with information about events, newsletters and wider industry developments in hazards based thinking. You can look at our tweets by **following the link below** (no account needed). There are 400million twitter users worldwide with well over 10 million users in the UK, enabling the Hazards Forum to communicate in a completely different way than it has before – linking through to key information on events and our newsletters.

If you haven't tweeted before then why not use this as an opportunity to start and follow the regular Hazards Forum updates? If you are already a regular twitter user then please follow us and also re-tweet us so that we can grow a strong follower base (@hazardsforum).

<https://twitter.com/hazardsforum>

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# Education, Social Media and the Internet: Inspiring Risk Understanding in the Y Generation

Neil Carhart

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On **Tuesday 19<sup>th</sup> March 2013** the Hazards Forum hosted an **evening event**. The event was sponsored by the Institution of Civil Engineers and was held at the Institution of Civil Engineers at One Great George Street, London.

The education system seems to be the recipient of endless criticism from business leaders for not producing graduates and school leavers with the skills and knowledge required by today's industry. At the same time the education system is not only under pressure to reduce costs but to squeeze more and more topics into the curriculum. This Hazards Forum event looked at **three of the main areas of education** to see what is being done to not only teach risk understanding but to make students industry ready.

The event began with a few brief words from **Hazards Forum Chairman** Rear Admiral (ret'd) **Paul Thomas CB**, who welcomed the audience and thanked the sponsors and hosts for the event. He then introduced the **chair** for the evening, **Lord Hunt of Chesterton FRS**, Professor of Climate modelling in the Department of Space & Climate Physics and Department of Earth Sciences at University College London and a Fellow of the Royal Society.

Lord Hunt introduced the three speakers for the evening. The first speaker was **Annette Smith**, Chief Executive of the Association for Science Education, who gave a talk on '*Safety and the perception of risk in schools*' with specific examples from the science perspective. She considered whether young people are adequately prepared to balance risk in their lives beyond school as well as within

it. The Association for Science Education encourages meaningful practical work in school science with due, but not excessive, consideration of the risk involved

The second speaker was **Terry Morgan CBE**, Chairman of both Crossrail and the National Skills Academy for Railway Engineering (NSARE). His talk, '*Apprentices and their role in filling the skills gap in UK industry*' focused on the importance of apprentices in the workplace, how they provide the backbone of most engineering firms in the UK and how apprenticeship schemes will play a key role in filling the skills gap currently developing in UK industry due to the aging workforce. Terry gave examples of the way apprentices are being educated, such as the NSARE and the Crossrail Tunnelling Academy.

The final talk of the evening was delivered by **Nicola Stacey**, the technical lead for Risk Communication and Management at the Health and Safety Laboratory. Her talk focused on the integration of risk concepts into undergraduate courses for engineers. Nicola gave an update on various initiatives led by academia, the professional engineering bodies and others to encourage good practice and an overview of on-going initiatives to develop new resources, including a brief tour of the Risk Education online community.

**Annette Smith** set the scene for her talk, describing her background as a teacher, working within risk communication and within the nuclear industry. She described her experience within the health physics department of BNFL at Springfields where she specialised in environmental health

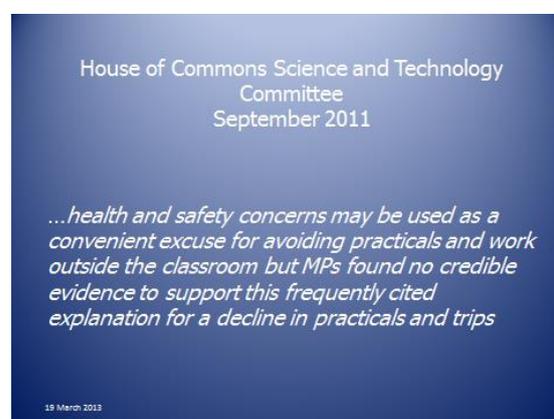
and safety. The 'mantra' within this group for addressing something noisy, dangerous, or risky was based around the three step process: (1) If possible, remove the hazard, if it cannot be removed; (2) Protect the hazard, for example by isolating it. If this cannot be done; (3) Protect the person. But this is not necessarily always appropriate. Sometimes we would like to undertake something with an inherent risk, albeit with the necessary personal protection. An example of this might be a particular school science experiment. We don't want to remove this experience from young people. We want science to be as exciting as it can possibly be, and some of these exciting things err on the side of hazardous. If young people are going to enjoy science, then the hands-on aspect, the real way in which it is different to other subjects, needs to be experienced by young people.

It is possible to create a safe environment and rely on films and simulations, some of which are very effective. However, there is nothing that can quite compare with actually doing an experiment for oneself. Not only is this a good way for young people to really understand what is happening, but it also provides a way to improve motor skills.

Annette discussed her experience at the UCL academy where a group of sixth-form pupils were performing titration using sulphuric acid. Actually being involved with the process is a great way to understanding the science and the method. Safely undertaking activities like this is an important challenge.

It would be a real worry if less practical and outdoor science were to be performed because of a fear of the situation, or the inability to access risk appropriately. There is actually good news on this issue though. In September 2011 the House of Commons Science and Technology Committee met, with Andrew Miller MP as their chair, to consider very carefully the obstacles to practical and outdoor experiments. They hypothesised that the

reluctance towards practical experiments might result from the perception of risk. Teachers, they theorised, might be less likely to initiate these activities because of the risks and the cumbersome nature of the related risk assessments. However, when they actually questioned teachers and educators about this they found that although health and safety could have been used as a convenient excuse to avoid practical and outdoor work, there was no actual evidence to say that this was the case. There may be a reduction in practical and outdoor science because of cost, lack of technicians or some other difficulty, but there was no evidence for a lack of willingness to assess the risks<sup>1</sup>.



Even so, if we are not careful we could too often fall on the side of caution. The Association for Science Education is frequently in correspondence with the Health and Safety Executive, particularly in ensuring that common health and safety myths are not prevalent in the things that are being written and discussed. We do not want to 'wrap children up in cotton wool' too much, and we certainly do not want to make experiments so anodyne that they cease to be of any value. That is not to say every experiment has to be exciting, some important experiments require patience.

Schools have a duty of care to children, and they have to make sure the activities they engage in are safe. Teachers have to conduct risk assessments for when something is taking place in a laboratory that might have a risk associated with it. However, children also need to be taught

how to assess risks for themselves, and this is far too often overlooked. This is perhaps the most important part.



The current National Curriculum for Key Stage 3 says that pupils should be able to assess risks and work safely in the laboratory, field and workplace. It is important to recognise that the ability to assess risk is part of the statutory curriculum of study, not just for Key Stage 3 but all the way through the National Curriculum. This is located within the science curriculum, making it the job of science teachers to make sure it is taught, though it needs to pervade beyond the science class. The draft National Curriculum<sup>2</sup> due to come into effect in 2014, under a section about scientific attitudes, also includes this need for pupils to be able to evaluate risks for themselves.

Teaching about risk starts in primary school. Help with the teaching of risk at this level is available, for example, in *'Be Safe!'* produced by The Association for Science Education<sup>3</sup>. This is essentially a manual which goes comprehensively through all of the activities that might take place in a primary school and the risks associated with them. At the same time as talking about conducting practical science safely, it is also helping teachers learn about assessing risk. At the very beginning of the book it talks about how to help young people understand risk. It takes the process out of the classroom to everyday situations such as in playgrounds and crossing roads. It talks about the responsibility of those teaching

science to help pupils in learning how to identify what is dangerous, how dangerous things are and how to avoid them. This includes a small section on the hazards of the internet. Very early on there is engagement with the fact that there are things which are not just physically harmful.

Through talking about these things with young people, they can extend what they are thinking about in terms of their science lessons into other contexts. It is easy to move from something relating to a practical experiment to things like safety on the roads and the comparative risks between modes of transport. As children get a little older incidents in the news can also provide a way to take the principles beyond the classroom. If something particularly hazardous is reported in the news this can initiate a discussion about just how likely it is to occur. You do not want young people to be unnecessarily scared by incidents in the news, so exploring the science behind why it happened and how often it happens is useful and important. Teachers can use the news to embed ways of thinking about problems in order to learn more about them. Older children can be introduced to the quantification of risk in a similar way. Visual pictograms can be particularly useful and powerful to communicate the likelihood of events.



The Consortium of Local Education Authorities for the Provision of Science Services (CLEAPSS)<sup>4</sup> provides information on hazards for primary and secondary schools. These include

documents for all the types of chemicals that teachers and pupils might encounter. On one occasion a teacher contacted CLEAPSS to enquire about the risks posed by pupils with painted nails. CLEAPSS investigated several types of nail varnish, and while the teacher may have liked to be able to ban nail varnish on safety grounds, CLEAPSS concluded there was little risk. CLEAPSS also provide student safety sheets associated with particular experiments, highlighting the hazards they might involve. These introduce to young people the principles of assessing risk for themselves, the chances of things going wrong, and what emergency actions should be taken if they do. This encourages young people to take responsibility for their actions, and equips them should something go wrong.

Annette concluded her talk by saying that the strategy must be to equip and encourage teachers to be confident in talking about and dealing with risk themselves, so that they are not just protecting young people from danger, but they are instilling those strategies in young people so that they can adopt them for themselves. If young people can gain a vocabulary to talk about risk then they can engage in exciting scientific activities and learn valuable lessons for life.

The second speaker, **Terry Morgan**, began his talk by describing the scale of the Crossrail project and its context within the railway industry. He described his role chairing the National Skills Academy for Railway Engineering, and the difficulties the industry sometimes faces in aligning what it needs in terms of skills. Without this it may be difficult for government and others who support the industry to identify how they can make the right training provisions for young people coming into the industry. He expressed his hope that the relevant work with Crossrail was the start of something significant to address this.

Crossrail itself is around 118km long, running from Maidenhead in the West to Shenfield in the East. The central section,

from Paddington to Canary Wharf, consists of tunnels, and strategically it goes to the South side of the River Thames. The project has £14.8 billion in funding capacity, but a recent decision to provide the rolling stock and depots with public sector funding increases this to nearer £16 billion. It is the largest infrastructure project in Europe by some way. It will have eight brand new stations in the central section which are essentially in the tunnel. The project is tunnelling 32km of new tunnels, involving 10,000 suppliers. By any stretch of the imagination, this is a significant undertaking.

Terry then addressed why the project is necessary. London is due to grow by 700,000 people in the next decade, and the existing tube services are already extremely stretched. Crossrail will increase capacity and reduce journey times. Data shows that most people will not commute more than an hour to work in central London, by bringing Crossrail into play and cutting commuting time, it is forecast to attract an additional 1million people who could travel into London in less than hour than is currently the case. The financial hub of the city has also previously complained about how difficult it is to get to Heathrow, the journey times to which are halved as a consequence of this investment. The business case is very strong. Railways always have, and will continue to bring investment and regeneration. It is projected that Crossrail will bring over £42 billion of economic benefit over its lifetime. The project currently employs around 7,000 people, next year this will be 14,000. This is just direct employment; the supply chain impact in addition to this means around 60,000 new jobs will be created.

Skills needs are forecast to outstrip supply by 2015. As governments, almost across the whole globe, start to recognise the importance of infrastructure investment, the skills gap becomes even more obvious. In London, the skills gap has never been covered by a programme of training. It has almost entirely relied on

people migrating into the city to meet its short term skills needs. Historically it has taken insufficient action to try and create a legacy of thoughtful planning about where those skills can be developed. There are clear benefits in doing this; it can create growth and opportunities for careers. Government has now begun to consider how this issue can be better managed. There is a National Infrastructure Plan, which in some respects is an aspirational plan of the projects it would like to see. In some areas it is still working on how to actual turn this ambition into a deliverable.

It is important to ensure that as these infrastructure projects come into play, there is a supply chain capable of providing the opportunities to use UK resources to support them. One of Crossrail's key objectives in terms of skills and employment is the importance of safety. The Crossrail sites can be dangerous unless you really know what you are doing. The project currently spends a long time ensuring people know what they are doing and that they have the competencies to fulfil their role. All the while, this approach keeps in mind the perverse dangerous impact that familiarity can have on safety.

Crossrail wants to create an environment where people have the best opportunities to improve themselves. Terry described the responsibility he felt, at a time when the project is attracting a huge amount of public sector funding, to ensure that it also responds to the jobs agenda in terms of skills and development for the future, and those currently out of work. The project is looking for ways to revitalise the skills base in areas that have been lacking. Governments often talk about academic qualifications, but the economy also needs vocational skills. There needs to be a better balance than has been the case for the last decade.

Terry then went on to look at what Crossrail has done to address this skills challenge. Those who have a contract with Crossrail not only have a contract for a scope of work, costs and schedules, but

also for certain obligations to the people on site. For example, it is stipulated that for every £3 million of contract value, there will be an apprentice brought in from those who are currently unemployed. This is not easy, in focusing on delivering on time and cost, the legacy and softer issue can get forgotten about. The project looked at underground construction skills and identified a need for around 1,200 people. They identified only around 700 suitably qualified people available in the UK, with an average age of 55. Over the lifetime of this project, if nothing was done, the average age would be around 60. This is not much of a legacy to hand on to the next project!

A skills academy has been constructed in East London, purposefully built in a disadvantaged area which could be regenerated. It has three main roles: The first is to test people's competencies and to ensure these are up to date and capable of supporting the safety first agenda. The second is to facilitate the commitment to have 400 apprentices on the project. Many will be at worksites, but the academy forms their hub. These apprentices will not only work on Crossrail, but will be ready to move into other key infrastructure projects. The third element involves a Memorandum of Understanding with Job Centre Plus. Some currently unemployed people, but with certain vocational skills, are identified and placed through a training programme. Of the first 1,000 people through this programme, 500 ended up getting jobs with Crossrail. 1,600 people have now been through the scheme, which has been so successful it is earmarked for further incremental funding. This is turning ambitions into deliverables. If you are going to make a difference, you have to take a hands-on approach to it.

The academy has a range of facilities to provide training in the necessary skills. The tunnels need to be sprayed with concrete, something which has historically been done mechanically, and with the assumption that at least 10 years' experience is required before someone

can be accredited to do the job properly. The modern process requires skills much more akin to those honed using Xbox and PlayStation controllers. The academy provides a means to harness and develop those skills. This facility is world class.

The Crossrail project has tried very hard to work with the rest of the industry to ensure that it is developing the right skills and creating a legacy of people who can meet their needs using the latest technology. This is good for the market, and good for developing individual ambitions. These things take time to get started, but the facility is already finding itself pressed for space.

The ambition going forward is to use it as a means to encourage young people at school through the Young Crossrail Programme. The project is trying to reach out to 500,000 school children, trying to create a bridge to understanding the opportunities of working within a programme like Crossrail. During construction it can be quite a disruptive project within London, so it is very useful to be able to engage with children and explain to them what is happening. Terry suggested that the direction from teachers and parents is still too academic, and more needs to be done at this level to address the balance with practical skills. The apprenticeship programme has many fantastic stories of those who have benefited from the opportunities it provides in vocational experience which can then be enhanced with academic study.

Terry summarised the key messages by reiterating the projects engagement with its apprenticeship programme, which has strong board level and political support. Whilst there is an expectation that it will be delivered on time and on cost, the added agenda of a skills legacy is also important

The final talk of the evening, given by **Nicola Stacey**, was based on her findings from working to integrate risk concepts into undergraduate courses. She began by looking at why it is important to teach

undergraduates about risk: If an engineer's underlying competence in risk management isn't there, regardless of the changes in technology, accidents will keep happening for reasons such as human error, design oversight and foreseeable misuse.

The importance of educating undergraduate engineers about risk, and instilling them with the motivation to 'promote safety', was recognised over 30 years ago<sup>5</sup>. Since this point, the same recommendations about these issues can be seen time and time again. More recently, for example, Roger Bibbings, in his Parting Shots column within the February 2013 RoSPA Occupational Safety and Health Journal<sup>6</sup>, reiterates the importance of risk education.

The need has also been recognised many times, for example, in the Engineering Council's original guidance on risk which describes the importance of senior engineers helping to mentor junior engineers. The Hazards Forum published a document entitled Safety by Design – An Engineer's Responsibility for Safety<sup>7</sup> which includes the importance of educating undergraduates:

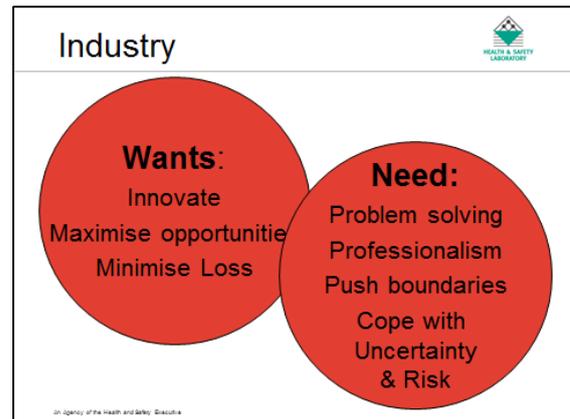
*"Only when consideration of safety, imposed by the professional engineer's code of conduct, permeates everything the practising engineer does in his/her professional work, and safety is seen as the watchword of the profession, will the profession have discharged its responsibilities and the public be reassured that with confidence they may place their lives in your hands"*

IOSH has a publication relating to this issue, there are reports within the EU, the Hatfield Report made recommendations about education and there have also been reports to parliament such as Rita Donaghy's report to the Secretary of State for Work and Pensions in 2009 'One Death is too Many'<sup>8</sup> which says:

*“There should be a review by Higher Education Funding Council for England (and the equivalent bodies in Scotland and Wales), the industry and professional bodies on the adequacy and relevance of university or college curricula on undergraduate and postgraduate construction related courses. The review should look at whether health and safety is appropriately covered in the curriculum”*

We should not lose sight of the significant incidents we are trying to avoid. Each time there is an incident, important lessons are learned and recommendations made by the investors, but how well does this learning actually get to the professional engineers making the crucial decisions? In addition to the large-scale industrial accidents, there are also many personal tragedies and financial impacts which we should aim to prevent. Nicola described how she believes the foundations for this process of effective learning needs to be built during a professional engineer’s formative education.

Manufacturing matters to the national economy. Industry wants people who can innovate. It wants to be able to maximise opportunities and minimise loss (in the widest sense of economic, human resources, reputation, market share etc.). To do this they need employees who can solve problems, who are professional, able to push boundaries, and cope with uncertainty and risk. In many respects the Y generation struggles with uncertainty. Nicola hypothesised that the constant testing new engineers undergo throughout their education leaves them focused on getting ‘the right answer’, even when there is no definitive solution. In order to be able to cope with uncertainty and risk, they need to experience it, to have the right attitude to recognise, understand and manage it. They need a healthy respect for risk without being scared into inaction by it. This is not easy if their academic training protects them from uncertainty.



The Engineering Council publishes the overarching document on the accreditation of engineering courses<sup>9</sup>, which states at the beginning that:

*“the objective of engineering professionalism is the public good”*

It also recognises that people study engineering for a variety of different reasons. It talks about the importance of understanding the legal requirements governing risks to health and safety as well as ethical and professional conduct. Some sectors accredit directly to the Engineering Council’s guidelines, but others, whilst fundamentally similar, have different scopes covering the scale of possible accidents they encounter and other specific risk management challenges. One example of more sector specific accreditation requirements is the Joint Board of Moderators who accredit Civil and Structural courses. Their guidance discusses the meaning of ‘good engineering’ and safety, talks about the “thread of health and safety running through the program” and makes an explicit link between this and professionalism. The IChemE have detailed requirements for health, safety and environmental learning outcomes. They also put a strong emphasis on managing this within the department and the leadership throughout the whole university.

Nicola then went on to look at the ways of teaching about risk. She suggested that from her experience, the most successful way of getting the health and safety

message across in the undergraduate curriculum is not to teach health and safety per se, but to demonstrate how an ability to manage risk holistically, including health and safety risks, is part of being a professional engineer. Links can be made to codes of conduct and the purpose of engineering to improve the world. It can then be an embedded issue. The Engineering Council's Guidance on Risk is a useful document to underpin the teaching of this subject.

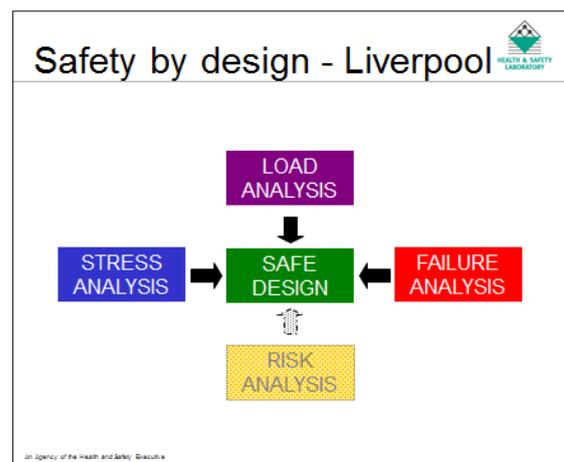
James Reason provided a good definition of what it means to be a professional engineer:

*"A capacity to see the broader picture, to think ahead and to draw upon a wide range of knowledge and experience so as to perform demanding work safely, elegantly and effectively. It means having a deep understanding of all the various factors that can impact upon task performances for good or ill. It also entails a willingness to engage in all aspects of the job – tedious or otherwise – to the best of one's abilities."*<sup>10</sup>

Being a professional is also about taking responsibility. There is a legal responsibility, but engineers also have a moral responsibility. To do this, they need to have the knowledge, understanding and tools to assess and manage risk, as well as the right attitude to this process. It can be quite difficult for students coming into university to make the transition from being the protected to taking on the responsibility of being the protector. They need encouragement and support to achieve this.

While some universities offer specialist diplomas, foundation degrees and master's degrees specifically in the topic of health and safety, and risk management, Nicola explained that her focus of interest is on how risk is taught to undergraduate engineers. One approach is for this to be integrated throughout the whole course, something very popular in Civil Engineering. Others deliver the

material in specific modules, more common in Chemical Engineering. Some universities offer optional fourth year courses on some of the more specialist elements. Graham Schleyer at the University of Liverpool uses a model for 'safety by design'. In this, risk analysis is just one of several engineering analysis techniques which when brought together enable safe design. It tends to be a less overtly visible and more integrated component, whereas load analysis, stress analysis and failure analysis tend to be more explicit.



Accident case studies are a popular means to educate about risk management. Sadly there are all too many examples of accidents that can be used. For several years, Queen's University successfully ran a major student led mock public enquiry.

Nicola worked with the University of Liverpool to develop an Incident Investigation Laboratory, which runs for three hours, during which the students investigate an incident based on one which occurred in 1994 at the Port of Ramsgate. As passengers were boarding a ferry, the walkway collapsed, tragically killing six people and seriously injuring a further seven. The students have to work out what happened, why it happened and who was responsible. They complete worksheets and then write a short witness statement. They have access to a computer simulation of the event which provides them with all of the information

they need. Through this they can 'talk' to witnesses, and explore documentation and designs. Nicola also pointed out that it is important to reemphasise to the students that safety is not just about avoiding these major incidents; it is a day-to-day activity which can prevent smaller injuries, disruptions and unwanted costs. The use of guest lecturers is particularly popular with students as they can bring the subject to life by speaking from their personal experience.

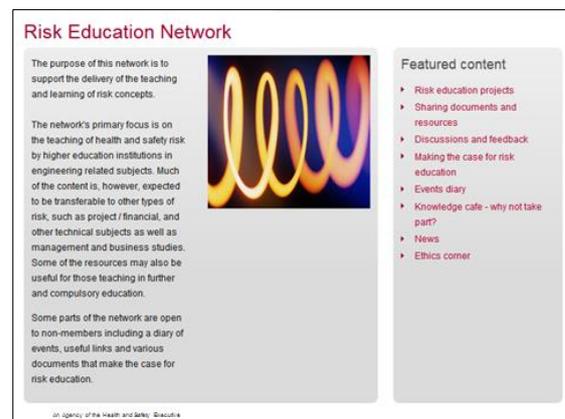
It is equally important to recognise success. Engineering is part of the solution. Great strides have been made over the last 100 years in protecting people. Some fantastic engineering projects, such as the Thames Barrier, exist for the primary purpose of managing risk.

Undergraduate design projects are another good way to cover risk management issues. Some design projects are paper-based, and risk management can tend to be glossed over or treated in a cursory way, but others are much more practical and can bring the issues to life. One example, from Sheffield School of Architecture, involved the construction of a community project in a public place. Safety was taken very seriously, and the issues were made tangible. There are lots of other examples around the country. At Portsmouth University, there is zero tolerance to not treating safety seriously in all aspects of study. Fourth year students mentor the first and second years in risk management, and they are assessed on how well they do this.

Another way to help students transfer from being the protected to the protector, and to develop their sense of responsibility is through workshop practice. Undergraduates in the workshop environment can be made to take ownership of the whole group's safety, and prove they have understood everything before they enter the workshop. The purpose of this is to move them away from feeling like the workshop

technicians will look after them and they are simply passive participants in the process who wouldn't be allowed to use the equipment if it wasn't safe.

There is a strong case for doing these things at undergraduate level. It does have an impact on students, and can be seen to work. They can be seen to gain a greater understanding of why safety is important to engineering and their view of engineering as a profession changes to reflect this.



**Risk Education Network**

The purpose of this network is to support the delivery of the teaching and learning of risk concepts.

The network's primary focus is on the teaching of health and safety risk by higher education institutions in engineering related subjects. Much of the content is, however, expected to be transferable to other types of risk, such as project / financial, and other technical subjects as well as management and business studies. Some of the resources may also be useful for those teaching in further and compulsory education.

Some parts of the network are open to non-members including a diary of events, useful links and various documents that make the case for risk education.

**Featured content**

- ▶ Risk education projects
- ▶ Sharing documents and resources
- ▶ Discussions and feedback
- ▶ Making the case for risk education
- ▶ Events diary
- ▶ Knowledge cafe - why not take part?
- ▶ News
- ▶ Ethics corner

an agency of the Health and Safety Executive

The Risk Education Network<sup>11</sup> is an online community supported by HSE, which aims to support the delivery of the teaching and learning of risk concepts. The online site contains a large amount of information from a wide range of sources to support the teaching of risk and safety within schools, further education and higher education. The background case studies detailing what is going on in this area can all be found through this site. There are many different resources available there on how to teach risk, as well as book lists, papers, and accident and success case studies. There is a section on 'Making the Case' for embedding risk concepts into engineering and space to share and develop resources, and individuals can upload their own materials, offer to give lectures or ask other members for help.

The Inter-Institutional Group on Health and Safety has produced an interactive demo CD with presentations and interactive tutorials for use within universities. IOSH have also funded a

report into how the information contained on this CD can be taken forwards.

There are three stakeholder groups, each of which has an important role to play to encourage good practice: Industry, the Institutions and Academia. Collaboration between these groups is essential. Those who understand the needs and practical applications need to collaborate with those who know how to teach and champion good practice. Nicola expressed her belief that a great deal of progress is being made, but that there is still some way to go, and we can do better if the key stakeholders pull together.

Nicola concluded by inviting members of the Hazards Forum with an interest in risk education to join the Risk Education Network.

**Lord Hunt** thanked the speakers for their interesting and distinctive talks before introducing the **discussion period** and inviting questions from the audience.

The first question, with reference to diminishing returns from investment in safety, asked at what point the Crossrail project would consider not spending money on safety. Terry Morgan responded that they would never stop considering spending on safety. He discussed techniques, such as ALARP (as low as reasonably practicable) which can be applied. He suggested that although there are many tools which can be used, when it comes down to practice; people sometimes think they know better. Some of the risks the Crossrail project concerns itself with may surprise people. One such risk is the risk to reputation. Another risk, and one that causes some of the most concern, is the risk of a collision between a truck involved with the project and a cyclist. To address this, anyone involved with driving materials onto Crossrail sites has to have attended a training programme. Around 4,000 drivers have been through this programme. Local children have also taken part in initiatives to help them understand the dangers of traffic. Terry described how talk of

'diminishing returns' may lead site managers to allow in trucks which have seemingly reached the site safely, but which do not have the appropriate safety materials. In reality, although it might appear to have little impact, this kind of behaviour would be unacceptable. The drivers will then soon learn that there is no excuse for not adhering to the standards. Terry believes the standards are right, and there is no need to compromise, accidents occur when the standards are bypassed.

The second comment from the audience came from someone who had recently visited a Crossrail site. They congratulated Terry on the level of professionalism they witnessed. Their question asked whether the academy approach, which is perhaps easier with the backing of a large project, could be filtered down to smaller projects elsewhere. Accepting that a large project may be able to better leverage its influence, Terry highlighted how the skills academy for underground construction is not branded with the Crossrail project. The advisory board includes representation from Thames Water, National Grid, EDF Energy, and in the future High Speed 2. The whole point is to create a scheme that is not project dependent, but that has some legacy attached to it. In two or three years' time, someone else with the same requirements, will be taking the lead on the academy

Lord Hunt described his experience working for the Met Office, and the degrees of uncertainty involved in weather and climate forecasts. He reiterated the need for a holistic approach in dealing with this, and asked the panel how they addressed the need for an open reporting culture, and how they encouraged the reporting and active learning from near-misses.

Terry made reference to the Bird triangle to emphasise the importance of reporting near-misses. If you only focus on the incidents that occur, then you will never get to a situation where you can manage

the risks effectively. In process terms, learning from near-misses can diminish the opportunities for actual unwanted events to be realised. The Risk Register is one of the most important ledgers that a project can have. It forces people to consider whether they have the resources to deal with risks, whether they are being managed, rather than ignoring them. By encouraging visibility of near-misses you can begin to see the trails which precede events.

Another question from the audience asked whether the learning from construction projects such as the Channel Tunnel, the Olympic venues and Terminal 5 would be carried forward into the future. Terry replied that Crossrail is certainly taking on board the learning from these projects, but expressed the difficulty that can arise in terms of homogenised corporate learning within a consortium of organisations.

The fourth question of the evening related to education about risk, and asked how far we can go to introduce risk to a broader audience, in subjects other than engineering and science? Annette described her previous experience working in the public understanding of science. Within this, risk was often a topic of discussion. It was felt that generally people understood relative risks (that one activity presented a higher risk than another) but it was largely taken for granted that people made decisions about risk every day. In teaching about risk, without acknowledging the social and psychological context, we do it a disservice. It is a little bit more complicated than balancing probabilities. Starting this discussion from a young age can be a very good thing, and this often means taking a broader approach than just science and engineering. Nicola added that there is also a danger in treating the public as a homogenous group. The general public needs to be treated with respect. We need to engage in a mature dialogue with them, and involve them in decisions, acknowledging that they have valuable knowledge and skills. Lord Hunt emphasised the

importance of understanding both statistics and causes. Then people can be informed enough to decide to change their behaviour.

A follow-up question from the audience asked whether risk and hazard can sometimes be confused, and perhaps we concentrate on one at the expense of the other. In some practical cases of risk the numbers involved can become too small to visualise, and there may be benefit to illustrating the impact of the actual hazard. Nicola agreed that this can be the case. Sometimes the numbers seem intangible, whereas the hazard can seem real. The danger of focusing on hazards and not the probability is that, as described earlier, this can lead to unwarranted levels of fear and caution. It has to be a balanced process.

Another member of the audience asked whether we are making too much of the problem of distinguishing between hazard and risk. He went on to suggest that in public enquiries surrounding land use planning, the public demonstrate a very good understanding of the difference between the two. A further audience member highlighted a paper entitled '*Risk versus Hazard: How to Regulate in the 21<sup>st</sup> Century*' by Prof. Löfstedt, chair of the previous Hazards Forum evening event. This paper, in the European Journal of Risk Regulation, shows the lack of consensus across the EU as to when risk or hazard should form the basis of a regulatory decision.

This was followed by a short discussion about the exposure of Generation Y to video games, where they may witness some very extreme and unlikely things happening. Lord Hunt pondered how individuals move from this imaginary world, to managing risk in the real world. A response from the audience suggested the majority of children are capable of making the distinction between these fantasies and the real world, and they might not be an inherently bad thing. Nevertheless, it is a challenge we need to consider, and as a community we need to

engage with how young people are being brought up, and what they are being exposed to.

Annette referenced the book '*Last Child left in the Woods*' by Richard Louv which discusses the idea that children are kept indoors to such an extent that they are not presented with the reality of nature's beauty, as well as its hazards and risks. They do not learn how to avoid, manage or mitigate those risks. It is much worse for a young person to be removed from these situations than for them to be informed about them and educated as to how to deal with them. Nicola added that social media and modern technologies may provide an opportunity to make some of the issues more relevant to young people, to educate them that they could be the ones making the decisions which could save lives, or they may be the ones at risk.

The final question of the evening asked whether there were any resources available aimed at educating senior managers about risk and hazards in the same way that undergraduates are being taught today. Nicola confirmed that some of the materials available through the Risk Education Network were indeed being used at that level.

**Lord Hunt summed up** the evening by postulating that one of the rules of science is testing hypothesis and when you do this, you always consider the limits of what you know, and indeed what you do not know. This is philosophically similar to the evaluation of risk, indicating it is very much a scientific activity.

Rear Admiral (retd) **Paul Thomas CB** thanked the speakers once more for their contributions and thanked those in attendance for their engagement in the concluding discussions as well as the sponsors. Delegates were then invited to attend the networking reception.

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<sup>1</sup> House of Commons Science and Technology Committee, 2011, Practical experiment in school lessons and science field trips, Ninth Report of Session 2010-12, Volume 1. Available from:

<http://www.publications.parliament.uk/pa/cm201012/cmselect/cmsctech/1060/1060i.pdf>  
[short URL: <http://tinyurl.com/cd3n8by> ]

<sup>2</sup> Department for Education, The 2014 National Curriculum, Available from  
<http://www.education.gov.uk/schools/teachingandlearning/curriculum/nationalcurriculum2014/>  
[short URL: <http://tinyurl.com/akvqyns>]

<sup>3</sup> 'Be Safe!' is available from The Association for Science Education  
[short URL: <http://tinyurl.com/d9a5e7d>]

<sup>4</sup> <http://www.cleapss.org.uk/>

<sup>5</sup> Tittes, E., 1983, Engineers' Training in Safety Technology, IJEE

<sup>6</sup> Bibbings, R., 2013, Education, Education Education, The RoSPA Occupational Safety and Health Journal, February 2013. Available from:  
<http://www.rospa.com/occupationsafety/resources/partingshots/info/feb2013.pdf>  
[short URL: <http://tinyurl.com/brq5chl>]

<sup>7</sup> The Hazards Forum, 1996, Safety by Design – An Engineer's Responsibility for Safety

<sup>8</sup> Donaghy, R., One Death is too Many – Inquiry into the Underlying Causes of Construction Fatal Accidents, 2009. Available from <http://www.dwp.gov.uk/docs/one-death-is-too-many.pdf>  
[short URL: <http://tinyurl.com/ccmmorx>]

<sup>9</sup> The Engineering Council, 2013, The Accreditation of Higher Education Programmes. Available from:  
<http://www.engc.org.uk/ecukdocuments/internet/document%20library/AHEP%20Brochure.pdf> [short URL: <http://tinyurl.com/38jnkp4>]

<sup>10</sup> Reason, J., 2008, The Human Contribution: Unsafe Acts, Accidents and Heroic Recoveries, Ashgate

<sup>11</sup> HSE Risk Education Network:  
<http://webcommunities.hse.gov.uk/connect.ti/riskeducation/grouphome>  
[short URL: <http://tinyurl.com/csky4qs>]

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## From the Secretary.....

As seen on Page 4, the Hazards Forum now has a **Twitter presence**. This became “live” after the Executive Committee meeting on 19<sup>th</sup> March 2013 so that it could be announced at the AGM and the Evening Event that followed. The background to this emanated from the previous Evening Event, in November 2012, when the focus included communications through social media. A number of younger people were present also, including post-graduate students studying various aspects of hazard and risk management. A question to delegates during the discussion period showed that a number of those present had tweeted during the event.

It was thus felt that there could be advantages in the Hazards Forum having a presence on Twitter for a number of reasons including the raising of awareness of the Forum and its work by sharing with others. Thanks are due to John Armstrong for taking the lead on this initiative. He is supported by others who have offered to be actively involved also. Feedback on this initiative would be appreciated.

A further innovation by the Hazards Forum in March was an **electronic survey** of members and guests who attended the Forum’s Evening Event. The idea was to seek feedback from those attending. The “Survey Monkey” system was used as it has become available for Hf to use through the administrative support services from ICE. Thanks are due to Tim Fuller for leading on this initiative. Any feedback on this pilot use of Survey Monkey – or further thoughts - would be of interest.

Continuing with the theme of raising awareness, Member organisations are reminded of the benefits of **sharing awareness** of their significant forthcoming events with the Hf community – ones that they feel would be of interest to this wider family. The Forum is happy to consider including such events in the Diary section of both the Newsletter and the Website and welcomes invitations to “support” such events.

Brian Neale

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## HSE eNews – Some Examples

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### **++ New Appointments to the HSE Board ++**

Jonathan Baume and George Brechin have been appointed to the Health and Safety Executive (HSE) Board as non-executive directors. Both appointments commence on 1st April 2013 and will run until 31st March 2016. John Morgan has also been appointed to the Health and Safety Executive (HSE) Board as a non-executive director. His appointment commenced on 1 May 2013 and will run until 30th April 2016. Paul Kenny and Frances Outram have also been reappointed to the HSE Board for a further three years from 1 October 2013 to 30 September 2016 in their respective roles of board member representing employee interests and board member representing employer interests.

<https://www.gov.uk/government/news/two-new-appointments-to-the-hse-board--3>  
<https://www.gov.uk/government/news/hse-board-appointments>

### **++ One in four London construction sites fail safety inspections ++**

A total of 93 of the 401 sites visited by HSE inspectors during a month-long initiative failed to meet the minimum legal standards for health and safety. During 2011/12, four workers were killed while working at construction sites in London and a further 471 were seriously injured. Nationally, there were 49 deaths and more than 2,800 major injuries.

<http://www.hse.gov.uk/press/2013/rnn-ldn-construction-results.htm>

### **++ HSE Chair Appointed IChemE President ++**

Judith Hackitt CBE, Chair of the HSE, has become the Institution of Chemical Engineers' 73rd president. Judith became president at IChemE's annual general meeting on 20 May 2013, taking over from Russell Scott. Describing her appointment, Judith said: "It gives me great pleasure to take on the role of IChemE President. I am proud of what the Institution, our profession and the industries that we serve have achieved. I recognise the need for IChemE to adapt and change in today's fast paced environment. We must use all of the knowledge that has accumulated since our foundation in 1922 and nurture and preserve the vital lessons that have been learned through success and failure in the process industries. During my Presidential year and thereafter my focus will be helping prepare the next generation of engineers and leaders to deliver against the IChemE's report *Chemical Engineering Matters*."

[http://www.icheme.org/media\\_centre/news/2013/health-and-safety-executive-chair-appointed-icheme-president.aspx#.UaSrAsqmX\\_M](http://www.icheme.org/media_centre/news/2013/health-and-safety-executive-chair-appointed-icheme-president.aspx#.UaSrAsqmX_M)

### **++ HSE brings crown censure against AHVLA ++**

The Animal Health and Veterinary Laboratories Agency (AHVLA), an executive agency of DEFRA (Department for Environment, Food and Rural Affairs), has been censured for safety failings relating to the control of biological agents at two of its facilities. This followed an investigation by the HSE into the handling of samples containing *Mycobacterium bovis* (*M. bovis*) - the causative agent of bovine tuberculosis (TB). The HSE found that between January 2009 and July 2011, an AHVLA laboratory in Exeter, had failed to appropriately inactivate *M. bovis* in samples that were subsequently sent to their Weybridge laboratory for genetic testing. Employees at Weybridge were put at serious risk because they handled the samples without suitable control measures, believing they posed little risk.

<http://www.hse.gov.uk/press/2013/rnn-se-13.htm>

### **++ Views sought on revised ACOPs ++**

The HSE has launched consultations on the revised content of two Approved Codes of Practice (ACOPs). Following an initial consultation in June 2012, it was agreed by the HSE board that a number of ACOPs would be revised, consolidated or withdrawn in line with the recommendation by Professor Ragnar Löfstedt in his report 'Reclaiming health and safety for all'. Consultative documents and draft versions of the revised ACOPs are available online at: <http://www.hse.gov.uk/consult/live.htm>.

### **++ Atomic Weapons Establishment sentenced for control failings ++**

The Atomic Weapons Establishment PLC has been ordered to pay more than £280,000 in fines and costs for significant failings relating to its use and control of explosive materials after a worker was injured when a fire broke out in an explosives processing building.

<http://www.hse.gov.uk/press/2013/rnn-se-13-awe.htm>

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## Parliamentary and Scientific Committee

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The latest issues of “Science in Parliament”, the journal of the Parliamentary and Scientific Committee of which the Hazards Forum is a member, has among its contents the following articles. Any member who would like any further information on any of the articles below should visit the PSC website [www.ScienceInParliament.org.uk](http://www.ScienceInParliament.org.uk)

THE ROYAL INSTITUTION 1799-???	Alan Malcolm
RESISTANCE FIGHTERS	Dr Mark Downs
ANALYTICAL MEASUREMENT AND REGULATION	Nick Boley
ADVANCING WOMEN IN MATHEMATICS	
THE NUCLEAR TECHNOLOGY EDUCATION CONSORTIUM	Dr John Roberts
ROYAL SOCIETY YEAR OF SCIENCE AND INDUSTRY	Dr Simon Campbell CBE FRS
TALKING TECHNOLOGY	Dr Matthew Aylett
CLIMATE CHANGE AND THE POLAR REGIONS	Addresses to the P&SC by Dr Emily Shuckburgh, Professor Peter Wadhams and Dr Sheldon Bacon
EXTREME SPACE WEATHER	Addresses to the P&SC by Professor Paul Cannon FREng, David Wade and Chris Train
INTERNET AND WEB PIONEERS WIN THE INAUGURAL QUEEN ELIZABETH PRIZE FOR ENGINEERING SET FOR BRITAIN	
VOICE OF THE FUTURE	
THE BIG BANG FAIR	
MRC MILLENNIUM MEDAL	
THE COMMERCIALISATION OF RESEARCH	Addresses to the P&SC by Steven Tait, Dr Bina Rawal and Professor Stepehn Caddick
SIN; OVERSEAS CHAMPIONS OF UK SCIENCE AND INNOVATION	Sam Myers
FRENCH RESEARCH AND HIGHER EDUCATION REFORM	Matthew Houlihan

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## Calendar of Events

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Please check the Events section of the Hazards Forum website for more information at [www.hazardsforum.org.uk](http://www.hazardsforum.org.uk) and to see any updates in the calendar. These may include additional events or perhaps amendments to the Events shown below.

Please note that attendance is by invitation.

Date	Event	Venue	Contact/further information
June			
3	ICE Event: Biological and Chemical Mechanical Processes in Geotechnical Engineering	Institution of Civil Engineers, One Great George Street, London, SW1P 3AA	<a href="mailto:events@ice.org.uk">events@ice.org.uk</a>
4	IMechE Event, Hf Supported: ALARP – learning from the experience of others	Institution of Mechanical Engineers, 1 Birdcage Walk, London, SW1H 9JJ	Diane Lorenzelli at: <a href="mailto:D.Lorenzelli@imeche.org">D.Lorenzelli@imeche.org</a>
12	SaRS Event, Hf Supported: Managing Ageing Assets: Everything gets old	Friends House, 173 Euston Road, London NW1 2BJ	<a href="mailto:info@sars.org.uk">info@sars.org.uk</a>
19	IMechE Event, Hf Supported: Process Safety: A Global Challenge (1 day seminar)	Institution of Mechanical Engineers, 1 Birdcage Walk, London, SW1H 9JJ	Taz Khatun at: <a href="mailto:process@imeche.org">process@imeche.org</a>
19	>> Hf Evening Event: Risk proportionality – measuring 'true' risk	Institution of Mechanical Engineers, 1 Birdcage Walk, London, SW1H 9JJ	Tim at <a href="mailto:admin@hazardsforum.org.uk">admin@hazardsforum.org.uk</a>
20	IMechE Event, Hf Supported: Mechanical integrity of process plant: New guidance on inspection and testing (1 day seminar)	Institution of Mechanical Engineers, 1 Birdcage Walk, London, SW1H 9JJ	Taz Khatun at: <a href="mailto:process@imeche.org">process@imeche.org</a>
September			
24	>>Hf Evening Event: The Crossrail major infrastructure project – high-end risk management at work (Provisional title)	Institution of Civil Engineers, One Great George Street, London, SW1P 3AA	Tim at <a href="mailto:admin@hazardsforum.org.uk">admin@hazardsforum.org.uk</a>
October			
3	SaRS Event, Hf Supported: SaRS2013 – Metamorphosis: Safety and Reliability in Times of Change	Friends House, 173 Euston Road, London NW1 2BJ	<a href="mailto:info@sars.org.uk">info@sars.org.uk</a>
16	IMechE Event, Hf Supported: Carbon Capture & Storage 2013: Reporting One Year On	Institution of Mechanical Engineers, 1 Birdcage Walk, London, SW1H 9JJ	Taz Khatun at: <a href="mailto:T.Khatun@imeche.org">T.Khatun@imeche.org</a>

The Hazards Forum's Mission is to contribute to government, industry, science, universities, NGOs and Individuals to find practical ways of approaching and resolving hazard and risk issues, in the interests of mutual understanding, public confidence and safety.

The forum was established in 1989 by four of the principal engineering institutions because of concern about the major disasters which had occurred about that time.

The Hazards Forum holds regular events on a wide range of subjects relating to hazards and safety, produces publications on such topics, and provides opportunities for interdisciplinary contacts and discussions.

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