

Round 4 (2010): *Ingenious* Final project summaries

PROFESSOR JOHN BARROW, Millennium Mathematics Project **Constructing our lives: the mathematics of engineering**

The project produced a new engineering strand on Plus magazine (<http://plus.maths.org/content/ingenious-constructing-our-lives>), aimed at a general non-specialist audience, highlighting the breadth and societal impact of engineering with a focus on mathematical aspects. The strand comprises 10 new articles and 3 new podcasts produced specifically for the project and published during its duration (please see attached sheet for more information). To produce these we have worked with 13 UK engineers from industry and academia, for 9 of whom this was the first experience in public engagement. The engineering strand, which is highlighted prominently on the Plus website, also collected together relevant existing content from the Plus archive, giving a total of 34 articles and 6 podcasts.

The project content covers a wide range of engineering topics, organised by the area of life they impact on: sport; music, film and art; energy and the environment; medicine and health; construction and architecture; transport; and computing and robots. In addition there is a section on careers in engineering, containing interviews with engineers talking about their jobs and their career paths. Covering such a wide range of topics and presenting the “human face” of engineering, the strand provides a rich resource, showcasing the impact of engineering on our daily lives and introducing role models to encourage the next generation of engineers. The content continues to gather positive reader feedback and discussion through our comment facility.

The material ranges from brief news items (eg about “intelligent” space craft), to in-depth articles (eg about the London 2012 Olympic Velodrome) and podcasts (eg an interview with engineers from the Centre for Sustainable Development at the University of Cambridge). This has enabled the participating engineers to contribute at a level they felt comfortable with, from answering a few quick questions via email, to recording an interview for an article and podcast produced by the Plus staff, or writing their own in-depth article with editorial help from the Plus staff as required. The response from participating engineers has been positive throughout. We have made valuable contacts and gained the necessary expertise to continue covering engineering related topics in the future.

All the content produced for the project will remain freely accessible on the Plus website, forming a permanent sustainable resource.

SHARON BISHOP, Cheltenham Festivals

Engaging Engineering - A new approach to public engagement training and development

A structured training course, built upon the expertise developed through Cheltenham Science Festival's global FameLab competition, offered 12 engineers a unique opportunity to develop their public engagement skills through the combination of formal learning and event delivery at the festival. The engineers have developed a strong network that, with the right encouragement, can not only continue to develop their own skills but also mentor future engineers and promote a wider understanding of the value of public engagement for a vibrant engineering industry in the UK.

Over 90 engineers applied for the course and 12 were chosen – seven from industry (Messier Dowty, Mott MacDonald, GE Aviation, Spirax Sarco, EDF Energy, Rolls Royce and Magnox North), one from the Science & Technology Facilities Research Council and four from leading universities (Liverpool, Glasgow, Cardiff, King's College London). None of the engineers had had any prior contact with each other but, under the expert guidance of the Programme Manager Timandra Harkness and facilitation skills of the primary trainer Malcolm Love, they rapidly formed a cohesive group.

As part of the programme the engineers participated in delivering schools' rocket-making workshops and four 'Meet the Engineer' sessions, where they discussed their work with adults. They also devised and developed an event that explained 'The Engineering of Ice Cream', which was performed to a large family audience to great acclaim. Approximately 500 members of the public engaged with the engineers across all events.

Whilst there are many learnings to take from this innovative approach, and certain improvements should be made for future endeavours of this type, the project proved to be a great success with positive feedback from all of the engineers and their employers. Indeed the group are working on a new project to deliver at next year's festival outside of the Ingenious grant.

For the Festival the key learnings from this exciting project were:

- More preparation time is required to start a project of this magnitude
- Mixing the formal training, watching festival events and event delivery throughout the week, rather than weighting formal training towards the beginning, would allow more time for constructive feedback and development of presentation styles.
- Better promotion of the events within the Festival programme would generate a bigger audience for adult engagement sessions.
- Although 12 was a good number for group work, it would be beneficial to divide the group for certain aspects of the course.
- There are significant opportunities for partner co-funding to deliver this type of training

A majority of these can be addressed by significantly extending the project planning window before the recruitment starts. This was limited due to the short gap between project approval and the start of the programme.

JACK BRADLEY, University of Bradford

Engineering a Sustainable Future

The general focus of the project was the construction of a sustainable house and renewable energy. Pupils were given the opportunity to choose construction materials to build their own model houses. The participants had to consider thermal conductivity of the materials and also related this to the costs of the materials used. A house kit was developed (walls, doors, windows and roof). Pupils were free to build their house to any shape, size and value. After the house construction, students calculated the heat loss from the house relating to the chosen materials. This project highlighted the importance of efficient house insulation and demonstrated how quickly investments can be paid back, saving energy and making houses more sustainable.

The Solar energy project was designed to increase understanding of sustainability in housing and solar panel efficiency. In the theoretical part of the project pupils listened to a presentation and on the practical side, pupils experimented with solar and photovoltaic panels and measured direct solar radiation from the sun and calculated the efficiency of the solar panels.

The Thermal imaging camera workshop involved a presentation covering the advantages of thermography relating to the evaluation of house insulation levels. On the practical side, pupils assessed the environment using a thermal imaging camera and detected heat loss from buildings, etc.

A key benefit of the project has been the skills acquired by the Engineers running the project. These skills include team work, communication skills with school children and the general public as well the generic skills of project management

DR ALISTAIR ELFICK, University of Edinburgh

Art-full Engagement: Beautiful Futures for Synthetic Biology

Synthetic Biology is a new approach to engineering biology, generally defined as the application of engineering principles to the complexity of biology. The aim is to 'make biology easier to engineer', through the design and construction of new biological parts, devices, and systems, and the re-design of existing biological systems for useful purposes, from food and biofuels to new medical applications. Biology is becoming a new material with which to engineering - a new technology for design and construction.

By instigating new collaborations between synthetic biologists, designers, artists, and social scientists, we are exploring shared and new territory between synthetic biology, art and design. What insights can design offer in creating microscopic entities for a human-scale world? Can the exchange of skills and ideas enable the development of new forms of craft and collaboration? Can these collaborations inform and shape the developing field of synthetic biology? How might our contemporary understanding of art and design be challenged by

interaction with synthetic biology? How can the learning generated be used to inform public engagement and can the creative communities act as an additional avenue for discussion of the issues raised by this challenging technology?

The project consisted of six reciprocal placements:

1. Biological engineer Fernan Federici and architect David Benjamin are investigating the complex behaviour of structural cells at the scale of microns and applying them as architectural design tools at the scale of meters.
2. Synthetic biologist Wendell Lim and product designers Will Carey and Adam Reineck of IDEO Inc. are considering the role that combining designers and synthetic biologists play in the future. What can the practices of human-centered design and science learn from each other?
3. Bioscientist Hideo Iwasaki and bioartist Oron Catts are researching the concept of biological lifetime (and its manipulation) as manifested by bacteria, animals and plants and their by-products, e.g. oxygen, as a fertile ground to explore different modes of time-based art practices.
4. Currently, the most common technique utilized to sequence or "read" DNA molecules yields data in the form of chromatograms. Composer Chris Chafe and scientist Mariana Leguia are working to 'sonify' chromatogram data: that is, represent the data in an acoustic form.
5. Biochemist Sheref Mansy and critical designer/artist Sascha Pohflepp are looking into the implications of creating like-like machines and the shifting ground beneath the division of the natural and the artificial.
6. Biologist Christina Agapakis and smell artist Sissel Tolaas tell the story of cheese, bodies, bacteria, and synthetic biology through a series of vignettes and sketches describing their collaboration. By foregrounding the process of their collaborative experiment and the ways they learned from each other, they hope to uncover new stories and processes of synthetic biology and art/science collaboration for a wide audience.

KAREN GILCHRIST, Redbird Media

New Haven: Access All Areas

Eden Fields began life under the title of "New Haven, Access All Areas". The name changed, but our aim remained the same - to bring together engineers and disabled people to explore ideas around access and inclusion.

The focus for the project was the creation of a lasting resource which could be used in school and professional workshops to look at inclusive and accessible design and engineering. We have developed a short film, of the type that you might see promoting new housing developments. A little bit "cheesy", it's meant to be a really believable promotional film that sings the praises of a development – Eden Fields – created with and for disabled people. The fact that the fictional development is exclusively for disabled people and their carers is a deliberately provocative factor. We want to liberate people to discuss the issues without worrying about right and wrong answers. But at the same time, we want to get people thinking about some of the small and large engineering adaptations that can make an enormous difference to the lives of disabled people.

The process of creating the film and web resource formed the heart of our project, in which we brought together engineers from a diverse range of organisations and members of an inclusive arts organisation – The Freewheelers

Theatre Company. We held two large scale workshops and three follow-on sessions. Engineers participated from Upton Mcgougan, Thomasons, the University of Surrey, Mole Valley District Council, Mott Macdonald, MERU and Promode.

The development of the film gave the project a focus for us to work on together. And the workshop sessions were highly collaborative, providing engineers with some new communication challenges. They needed to work effectively with people who had a range of physical, sensory and learning disabilities during the sessions. In addition, we filmed the engineers at various stages during the workshops – helping them to develop their interview techniques. Many said that it was the first time that they had appeared on camera – and they enjoyed the experience.

We have now produced the film and website, and tested the schools resource with young people in Years 7 and 8 and in the 6th form. The materials have been piloted in RE, D&T and HLSA (sports leadership) lessons, and we have a template which can be used to take the session into other settings. The website also contains the ideas developed in our workshop sessions, and video interviews with the engineers.

The participating engineers were full of energy, ideas and commitment to the project. Members of The Freewheelers participated enthusiastically in individual sessions. But, because many have some degree of learning disability, it was more difficult for them to have an overview of how the project was moving towards the creation of a video-based resource.

We believe that we have largely met the original aims and objectives of the project, and we have developed resources that are ready to be used by the participants and others for future workshops.

ELIZABETH GRAFTON, Young Engineers

Meet the Public

Practising engineers will work alongside Young Engineers staff to engage the general public in inspiring bite-size engineering activities at local Science Festivals, County Shows and other public events across the UK. The selected engineers will have the unique opportunity to work with experienced Young Engineers fieldworkers to adapt practical, fun, tried and tested school focused activities to ones which are easily accessible and engaging for the general public. They will be able to build into the activity key messages about the importance of their specialism and their company's role in society and will be trained on how to communicate effectively with those of varying age, culture, gender, social group and ability, enabling them to effectively share their stories, passion and expertise with the public.

DAN HILLIER, UK Astronomy Technology Centre

Big Telescopes for Big Questions

For the first time, the UK Astronomy Technology Centre has a group of 14 engineers (approximately 25% of our engineers) who have been through a shared programme of professional development in public engagement. It has

strengthened their confidence, enthusiasm and experience in public engagement.

The initial stage of the project involved recruiting 10 interested engineers from the UK ATC and developing their public engagement skills through participation in existing activities of the Royal Observatory Visitor Centre programme and training provided by other science communication organisations and individuals. The engineers were from a variety of disciplines (optical, mechanical, systems, software) and career stages, the majority having had only very little public engagement experience, through the annual Royal Observatory Edinburgh public open days. The group participated in a variety of different events, including drop-in hands-on activities for families (including 'Physics in the Field' activities with the BBC Big Bang team as part of the Edinburgh International Science Festival), structured short talks to public audiences, schools' engineering fair, the IoP Lab in a Lorry and the Royal Society Summer Science Exhibition. All the engineers also signed up to the STEM ambassador scheme, and 50% took part in science communication training provided by organisations such as Glasgow Science Centre and Our Dynamic Earth, highlighting the basic skills of science communication and how to develop activities for different audiences.

Following the training stage, the engineers were then involved in various brainstorming sessions to develop ideas for schools' resources specifically linked to the engineering work of the UK ATC. Working with our partner teacher, the ideas were refined in line with school curriculum outcomes. A subset of the engineers, along with 4 other senior engineers, worked on developing the best 2 resource ideas (mini-robots and an image slicer demonstration incorporating mirror alignment), designing and manufacturing kit, testing and writing up activity notes, ready for piloting.

A total of 6 engineers were involved in 5 different pilot sessions (3 with the image slicer demo and 2 with the mini robots) involving school pupils, secondary school science teachers and general public audiences.

SIMON JAGO, Techniquest

Engineering our Future

This project recruited 62 engineers from across Wales from local industry and academia to enable them to deliver an engineering public engagement project.

Techniquest ran training sessions for all 62 participating engineers. The training workshop explored with the engineers public engagement techniques.

Techniquest then worked with the engineers to design a public engagement programme that focused on their business and the issues they face.

Techniquest staff and the participating engineers delivered a hands on session to secondary school pupils to inspire them in engineering and wider STEM (Science, Technology, Engineering and Maths) education, employment and training.

The participating engineers then delivered 55 public engagement sessions at schools across Wales. In total, approximately 1,375 pupils benefited from this project.

DEBORAH KERMODE, Bright Space

Future Vision

Young people from four Birmingham schools celebrated the culmination of an engineering and architecture project called Future Vision on Thursday 7 July, which has seen them develop designs for a library and theatre complex of the future. Taking inspiration from the new £188.8 million Library of Birmingham, which will be joined to Birmingham Repertory Theatre, they have been working with engineers from Midlands-based construction company, Carillion, and local engineering firms, Thomasons and Stewart & Harris. Birmingham architecture firm, Hunt Feneley, led the initiative and helped the pupils develop their designs.

Over the course of the project, which was funded by the Royal Academy of Engineering Ingenious grants scheme and delivered in partnership with Bright Space, Birmingham Repertory Theatre and Mecanoo (architects for the Library of Birmingham project), the children took part in ten sessions during which they learnt about the planning, design and engineering processes involved in creating a major new building. They also explored what a library is, whether they need to adapt to meet the demands of the modern world, and if 'library' will be the right way to describe them in the future.

To provide inspiration for their designs and to help them understand the impact that buildings can have on an area, the children visited both the Library of Birmingham and Birmingham Repertory Theatre construction site, as well as architectural projects in the UK and further afield.

Small Heath School went to London to see the Tate Modern, Millennium Bridge and the London Eye, while Swanshurst School in Billesley went to Salford, to take in the Imperial War Museum North, The Lowry, Royal Exchange Theatre and the Manchester Civil Justice Centre. Turves Green Boys School in Northfield travelled to Delft in the Netherlands to see the spectacular TU Delft Library, designed by Mecanoo. They also visited the company's impressive headquarters, a former chapel also in Delft, while Harborne Academy travelled to Oslo, to visit the new Opera House and Museum of Architecture.

Pupils went on to develop designs for their own library and theatre of the future by sketching ideas, testing them with a 3D programme and producing models of the buildings to check potential design issues and investigate possible problems with the planned structure.

ALEX LOVE-RODGERS, National Museums Scotland

Inspire Me

Inspire Me was a project run by the National Museum of Flight, one of the sites of National Museums Scotland, with the support of an Ingenious grant from the Royal Academy of Engineering. The museum's 50 aircraft and 1000's of related objects make it an inspiring place for the public to engage with engineering.

This project saw 14 engineers from academic and industrial backgrounds trained to develop and deliver simple public engagement activities. 12 of the engineers went on to deliver their project to the general public or primary school children.

The greatest challenge to this project was recruiting engineers to take part. Several hundred individuals and institutions were contacted through several networks but only a quarter of the original target were trained. Large numbers of individuals were keen to take part but it proved difficult to convince management to release them for the day's training. This has been an important learning point for us. To overcome this problem, public engagement organizations need to continue to build relationships, especially with the universities and large employers, to convince them of the value of this work. We will increase the amount of pre project research we carry out, encourage managers from engineering companies to attend events and generally raise the profile of the public engagement activities we carry out. The fact that the engineers' experiences were so positive and the quality of engagement was good should make this task easier.

The engineers delivered their workshops at two large scale events at the National Museum of Flight, Into the Future and Magnificent Machines, as well as a special schools day. Thanks to free buses provided by the grant there was less than an hour between teachers seeing the emailed advert and the day being fully booked. The events reached over 4,000 of the general public and 190 pupils and teachers. Only 58% of families said they knew an engineer, and only 36% of adults said they would consider working in engineering however 72% of children said they would consider a career in engineering. This was an excellent result and exceeded our expectations.

All the engineers who took part enjoyed the experience, and all but one would like to take part in more activities at the National Museum of Flight. One of the engineers who took part has obtained a Royal Society Partnership Grant and is working in a school.

KAT NILSSON, Science Museum

The right tools: equipping engineers with public engagement skills

The Right Tools project at the Science Museum equipped ten engineers with the skills to present, discuss and write about contemporary engineering for public audiences and gave them opportunities to do so through a programme of innovative public events. They were trained how to use the innovative 'Talkaoke' table, they contributed to gallery and online content, and participated in dialogue events at Science Museum's Dana Centre. The participants gained experience of sharing their expertise with the public and were able to explore the social impact of their work. In addition, they gained an insight into how science and engineering are communicated within the museum context and a greater understanding of how to discuss their work with the media. The Science Museum and its visitors benefitted from having a pool of experts, freshly equipped with communication skills and confidence to explore the impact of contemporary engineering on our lives today and how it will shape our future.

OUTPUTS

Training

Thirteen engineers were trained in public engagement at the Science Museum. They received facilitation training in January and February 2011 and completed

one-day courses on writing and presentation skills during March 2011. Although 13 engineers were involved at the outset, three did not continue to deliver events or blogging with the Science Museum, citing distance, job relocation, or work commitments as reasons why they couldn't continue.

Resources

Thanks to this grant, the Science Museum is now the first institution with its own Talkaoke table, which is a bespoke doughnut shaped table with inbuilt PA and lighting system. The table enabled the participating engineers to directly engage in dialogue with the public in a format that is innovative and informal.

Events and blogging

The Science Museum ran a variety of events to involve engineers from the project. Engineers were also invited to be guest bloggers on the Science Museum's news website, Antenna. This enriched the content by providing expert perspectives on news stories. The events and blog enabled engineers to engage in a variety of ways with different audiences, both within, and outside the Museum. The engineers that were involved with delivery were:

- Morgan Mager – Imperial College
- Julie Winnard - Surrey University/ Ford Motor Company
- Sophie Robinson - University of Liverpool
- Simon Smith – BAE Systems
- Gillian Claire Walker - University of Reading
- Kate McNicholl - Zerum Ltd
- Sally Dutton - Department for Transport
- Ben Thornber - Cranfield University
- Claudia Walter – Imperial College
- Jaclyn Tsui - Hertfordshire County Council

OUTCOMES, IMPACT AND LEARNING:

Overall the training and engagement activities were very successful in meeting their objectives. An independent summative evaluation demonstrated that:
Our audience showed an increased awareness of engineering.
The engineers gained skills and awareness about public engagement.
At least one engineer gained insight about the social nature of her work.

MIKE RIDLER, By Design Group

Energising Engineering

The 'Energising Engineering' (EE) project encompassed a series of interactive workshops centered on renewable energy systems. During these workshops participants were encouraged and aided to build several different models which explored a variety of renewable energies. The workshops varied in length and content depending on the type of delivery location. During the project the workshops took place at 14 schools and shortened versions of the experiences were also provided at the discovery zone of the Cheltenham Science Festival over a five day period.

The project was managed by By Design Group, a leading interactive education provider and collaboration partners included CREST, the Centre for Renewable

Energy Systems Technology from Loughborough University and the Environmental Technology Centre from the University of Nottingham as well as professional engineers and PhD engineers from other engineering departments at Loughborough University.

The project aimed to engage participants with renewable energy systems technologies whilst introducing the public to engineering in a wider context. An equally important output was to provide real life engineers the chance to participate in public engagement, learn new skills and pass on their own experiences and knowledge of engineering to the general public.

22 engineers engaged with the project and most helped deliver at least three days worth of workshops. Audience varied from year 5 up to year 12 within the school environment and from three years old through to much later years at the science festival. Feedback from the engineers involved has been extremely positive with many claiming they not only enjoyed the experience but have gained many new skills in communicating, mentoring and even classroom management. Since the project commenced eight of the engineers involved have already gone on to continue with public engagement activities having aided in the delivery of further STEM (science, technology, engineering and maths) outreach projects.

The three workshops the engineers delivered comprised of the assembly of model kits which explored solar energy, by building a solar powered buggy, wind energy, by building a model wind turbine, and hydroelectric energy, by building a hydroelectric generator. A variety of experiments were then carried out on the models to explore the subject matter further. Whilst participants built the models the engineers were on hand to aid in construction, explain some of the concepts and talk about their own experiences of engineering.

At a number of the schools visited the engineers present on the day also gave a brief presentation to sixth form students on engineering options in higher education and then fielded questions from the students. The project was received extremely positively by both participants and the engineers and the extra presentations to sixth formers, something which grew organically through the project and was not initially planned, was an additional outcome. (A more in-depth project brief is attached at the end of this report)

DR CHRIS SMITH, University of Cambridge

The Naked Engineer: The science behind the solution

The Naked Scientists, which is a live, interactive science radio programme produced at Cambridge University, reaches audiences in the millions. It impacts upon a broad demographic encompassing young pre-teenagers through to retirees. One of the fundamental aims of the Naked Scientists is to provide balanced coverage of the full spectrum of scientific research disciplines.

Recognising that engineering, and contributions from research-active engineers, were under-represented within our outputs, we initiated this project to create a ring-fenced engineering-relevant segment within our mainstream Naked Scientist programmes.

Launching in September 2010 with support from the Royal Academy of Engineering's Ingenious programme, and guided by the engineering community themselves, we created Naked Engineering.

Throughout the funding period, ten minutes of airtime was regularly set aside within our Naked Scientists BBC programme and podcast to feature a pre-prepared audio segment comprising an interview with an engineer and a demonstration of a solution to an important engineering problem or an experiment for listeners to try at home that demonstrated a key engineering principle. In parallel with the audio, a stand-alone video podcast was prepared for each topic and made available via our website and Youtube.

Topics covered included the design of building ventilation systems, the workings of arches, superconductivity, ultrasound imaging, how Lego can teach the next generation of young engineers, biomimetics, chemical engineering and the workings of jet engines.

Over 50 multimedia episodes were created, featuring 30 research-active engineers based in academic and industrial settings. The material has received over 1,500,000 downloads so far and reached at least the same again on the radio. One of our video items, on "Green Tide Turbines" – a group developing high-efficiency turbine systems for micro-hydrogeneration - was subsequently also broadcast on BBC television.

ALICE TAYLOR-GEE, British Science Association Engineering Media Fellowships

The Media Fellowships, now in their 25th year create a greater awareness and understanding of the workings of the media among practising scientists and engineers. The Fellowships provide placements with a national press, broadcast or internet journalist. In 2010/11, the Royal Academy of Engineering funded two engineers to take part in the scheme. One Fellow was based with The Irish Times and the other with the Times Higher Education supplement with a supplementary placement with the Royal Society Press Office. An additional engineer was also a Media Fellow and although not funded by RAEng was considered an Engineering Media Fellow and was placed at the Naked Scientists in Cambridge.

Following some basic media training, from journalists and communications experts, the Fellows were thrown in at the deep end. Each engineer spent about a month working within the conditions and constraints of the media. Mentored by an experienced journalist, the two engineers produced, between them, nearly 30 pieces about developments in science & technology, both online, in print and audio. They also attended the British Science Festival, experiencing the intensity of a busy press centre with back-to-back press conferences on the hundreds of events taking place.

The scheme demystifies the media and the news gathering process – knowing that 'subs', not journalists write the headlines, understanding what journalists need from engineers when researching and writing an article.

Fellows greatly enhance their communications skills, whether their ability to write quickly, efficiently and engagingly or to ensure they communicate one key message during a radio interview. Their confidence to work with the media also develops. As one of the Fellows said, "The main lesson I've learned from this experience is that – if they understand each other's motivations – the relationship between journalists and scientists can certainly be mutually beneficial, and it's vitally important to get more scientists to take a proactive approach in promoting both their own research and science in general." The other engineering Fellow said, "The fellowship has taught me a lot about how to relate to the media in the future from a professional perspective. It has also informed my personal opinion on the role of science within the media and the complexity of the relationship."

The scheme's impact extends well beyond the summer placements. Fellows are better equipped to communicate their research and expertise to the public and their colleagues. Amongst other activities, these engineers have given media seminars to their colleagues, created a research group blog, written an article for Women in Science and Engineering, joined the British Science Association Engineering Section and set up and run public engagement exhibitions and talks at the British Science Festival.

RACHEL TOBBELL, UK Resource Centre for Women in Science, Engineering and Technology (SET)

Ingenious Women: Communicating a Passion for Engineering

The UKRC's Ingenious Women Project is an innovative project which brought together 20 early to mid-career engineers with experienced communication mentors, to enable them to develop their competence and confidence as communicators to a range of audiences. The engineers received media and effective presentation & communication skills training, and were encouraged to look at different media types, including new media such as Twitter, blogging and Second Life to raise awareness and the profile of women engineers.

The women came from a range of engineering disciplines, including: Environmental; Air Transport; Manufacturing; Boiler Integrity; Electrical; Computing; Motorsport (Formula1); Biomedical; Earthquake; Mechanical; Civil & Architecture. Sectors they worked for included 1 academia, 1 entrepreneur, 4 public sector and 14 private sector organisations. Please see <http://www.theukrc.org/about-us/our-projects/ingenious-women/the-20-engineers> for short biographies of each engineer.

The Communication Mentors role was that of expert advisor, supporter, source of ideas and to suggest actual opportunities for engagement. Mentors came from a variety of media backgrounds to give a well-rounded overview.

At the start and end of the project each woman completed a questionnaire asking about their level of competence and confidence against certain presentation and media skills. The final results showed that Twitter competence and confidence increased by 52% on average, and blogging had a 43% average increase. Public speaking showed an increase of 18% in both.

Completed activity reports submitted by the women throughout the project's duration showed final project outcomes of 20 presentations to total audience numbers in excess of 750, 18 Tweeters, 6 attendances at science/career fairs, 7 women with their own blogs, 13 articles written, 7 new case studies, 4 new ambassadors/ mentors, 4 radio interviews. More general activities, such as an online survey, attracted high levels of interest and media coverage.

The UKRC's learning includes an increased knowledge of the breadth of engineering, improved media awareness and contacts, and insight into the support women need to build profile and the barriers they face. Our decision to hold the skills training workshops on consecutive days led several women to comment that this had helped them to make better bonds, therefore forming a stronger network. Many have stated that they have benefited greatly from meeting each other, being inspired and supported, and that they intend to keep in touch.

The media mentors varied in the time they could commit, but all met the women in person, two hosted site visits that were of particular interest (the Economist and the Science Media Centre), and several provided online, telephone and in person support to individual women on an occasional basis.

PROFESSOR YORICK WILKS, Oxford Internet Institute

Technical and Ethical issues in the Engineering of Artificial Companions

Professor Yorick Wilks, a Senior Research Fellow at the Institute, will lead this project to promote wider discussion about the social and ethical issues surrounding the use of 'Artificial Companions' which could function as long-term companions for the elderly, to teaching companions for the young and travel companions for those away from home.