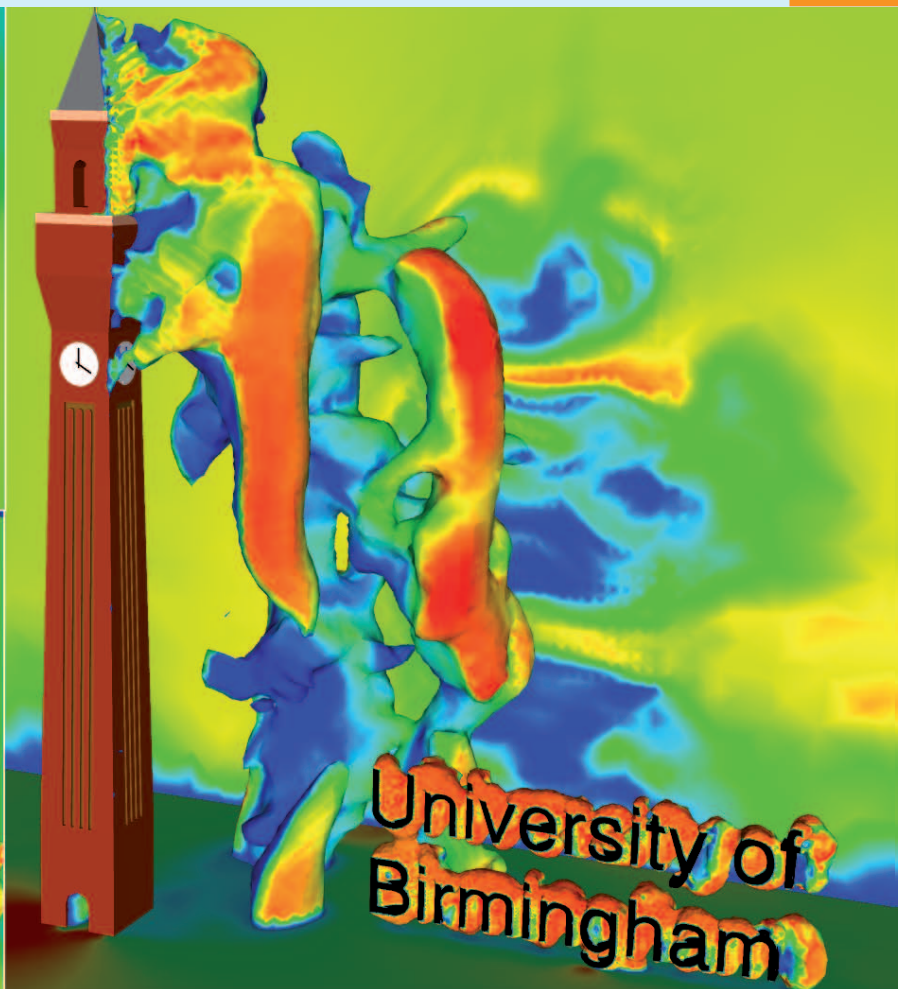
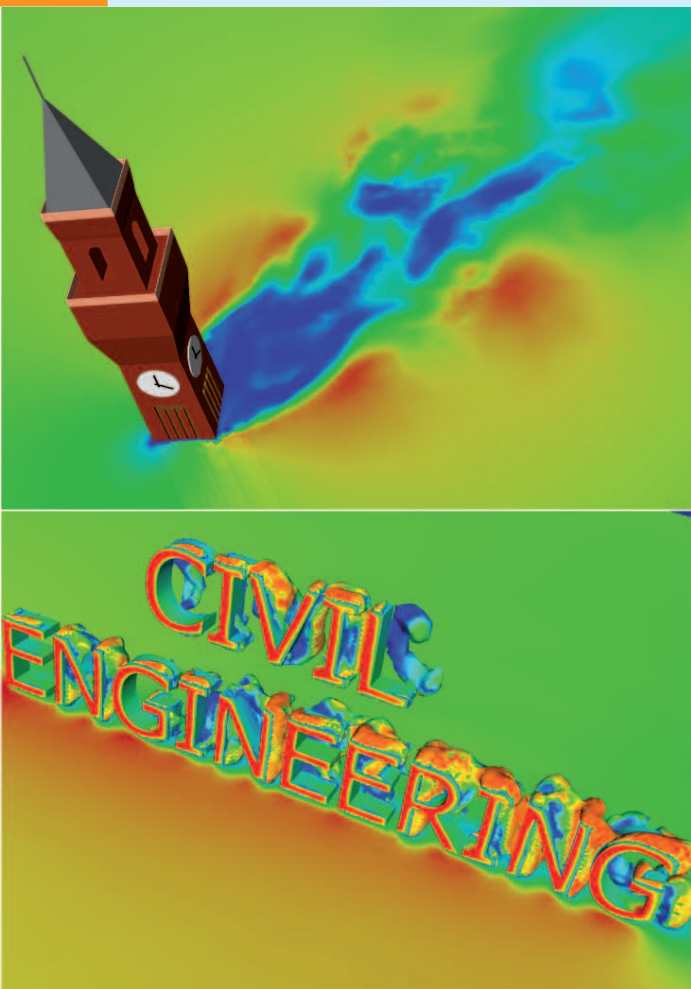


2013

College of Engineering
and Physical Sciences

School of Civil Engineering Newsletter



Large eddy simulation of wind flow around Old Joe (Dr Hasson Hemida)

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Head of School welcome

Professor Mark Sterling, Head of School, writes...

As the saying goes, “time flies when you are having fun” and as I reflect on the year which has indeed flown by, I can say with certainty that the life of the School has not been dull; we have much to be proud of. I am pleased to announce that we are strengthening our academic staff with two new appointments (details can be found on page 5) and that we have received an additional £100,000 investment in the laboratories in order to enhance the student experience.

The School continues to go from strength to strength. At the time of writing we are placed fourth in the Russell Group for overall student satisfaction (a climb of four places compared to this time last year) while the impact of our research continues to develop and expand (John will discuss this later and I would get into trouble (again!) if I steal his thunder). All of the staff have worked extremely hard this year and to single any one out would be wrong, however, there is one person who does deserve praise (you know who you are...).



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The Civil Engineering degree

Training for employment or nurturing the intellect?



John Nolan, Royal Academy of Engineering Professor of Innovation and Design, writes...

I suspect that the average student that enrolls on a Civil Engineering degree course does so because they are strong on maths and science and would like to use those skills in an interesting, creative career where employment prospects are good. At that stage, it's likely that all but a lucky few will not know enough about the profession to decide which branch of it they will eventually pursue. Indeed they may well find that what they eventually do in their career is quite different to what they were doing in their first postgraduate job. In my own case, I started work as a contractor, was lucky enough to spend time in their design office and consequently realised that I enjoyed designing structures more than managing their construction and so moved into consultancy. I know a number of engineers who did the reverse. Indeed when I look at my student cohort they ended up in a wide variety of jobs with often very different knowledge bases.

Clearly it is impossible for any Civil Engineering degree course to teach to sufficient depth in all potential Civil

Engineering career options, such that whatever their career choice the graduate will be capable of being productive on their first day at work. However, it is to be hoped that they will have sufficient core knowledge that they will become useful fairly quickly. In addition it is to be hoped that their minds have been trained to be able to continuously build their knowledge and ability throughout their career, whatever twists and turns it might take, and that they are skilled problem solvers who are comfortable working in a team.

So what is core knowledge? Civil engineers have the privilege of understanding the mechanical behaviour of the physical world. Every plant, animal and human, and the entities they create, have structural form which will behave in accordance with the rules taught in a civil engineering structures course. Examples range from a butterfly wing to a honeycomb; an eggshell to a bamboo pole; our skeleton to a table; a scaffold to the Burj Khalifa... indeed a structural engineer friend of mine was commissioned to carry out the structural design of an artificial hip.

Whether you are a consultant, a contractor, or working for a utilities company, an understanding of structural behaviour will be needed throughout your career. This is stating the obvious with regard to consultants, but contractors make daily decisions regarding loading of materials and temporary works which can be disastrous if they don't understand how the load can be safely transferred to the ground. Indeed an understanding of bending, shear and deflected shape in structures can help spot potential mistakes in reinforcement positioning in an r.c. frame, for example. The failure of electricity pylons in the recent blizzard highlights structural failure in utilities, as was the bursting of joints at bends in a large fire water main I

investigated early in my career where the resolved forces in the bends due to the water pressure hadn't been adequately addressed.

Clearly the majority of construction applies load to the ground or sustains load from it, so knowledge of soil and rock mechanics is vital. As is fluid mechanics, not only to enable understanding of fluid flow in pipes and channels, but also to understand the dynamic effects that fluids can have on structures be they gaseous or liquid.

Materials science is another core area of knowledge. How can you design or manufacture anything unless you understand how the materials that you use will behave under both static and dynamic loading over time?

Finally as the applied mathematicians of the construction industry we need to understand the mathematics that enables us to model the above.

Does this imply that other subjects are less important or unnecessary? Certainly not. All knowledge is valuable and you can't always predict when you might need it. For some specialisms the knowledge of some or all of the other subjects on the course may be a prerequisite of employment. Additionally, the university experience is intended to generate well-rounded, well-educated graduates who have a familiarity, at least, with the terms that will be defined by their later working career. A degree is the foundation on which a lifetime learning experience is built. It is there to both nurture the intellect and initiate training for work, but the serious training starts when you get a job and accumulate practical experience in one of the most enjoyable careers it is possible to have.



This year's research awards



Professor John Bridgeman, Deputy Head of School, writes...

2013 is an important year for research-intensive universities such as Birmingham, as this is the year in which we make our submissions to the Research Excellence Framework (REF). The REF is the Higher Education Funding Council for England's approach to assessing research quality in Higher Education Institutions (HEIs) and for allocating its quality-related research funding. REF replaces the previous system, the Research Assessment Exercise.

The REF has a number of roles, each of which is vitally important to universities. The outcomes will be used to inform the selective allocation of research funding to HEIs, with effect from 2015–16; they will provide accountability for public investment in research and produce evidence of the benefits of this investment; and also provide benchmarking information and establish reputational yardsticks. There is, therefore, a lot riding on the REF for universities and the individual schools and departments within.

As with many aspects of life in Higher Education, the REF is a process of expert peer review. HEIs will be invited to make submissions in up to 36 units of assessment. Submissions will be

assessed by an expert sub-panel for each unit of assessment, with each sub-panel applying a set of generic assessment criteria and level definitions, to produce an overall quality profile for each submission. Civil Engineering is one of those units of assessment and is the sub-panel to which most, although not all, of our research will be submitted for scrutiny. The deadline for submissions is November this year, although the outcomes of the process will not be known until the end of 2014, and the funding implications felt the following year.

The REF process is a lengthy and complex one, but one which research-intensive universities should see as an opportunity, just as much as a challenge. This is the School's primary opportunity to demonstrate to its peers, funders and stakeholders the breadth, depth and quality of research undertaken and delivered. Civil Engineering as an academic discipline is, by its very nature, one of the more diverse subject areas, containing a myriad of sub-disciplines within it. No single university school or department could claim to cover all aspects of civil engineering research; however, here at the University of Birmingham we are proud to have a research strategy which is sufficiently flexible and responsive to meet the infrastructure challenges of the 21st century and beyond, based on some solid traditional disciplinary foundations.

The School has two core research themes (Railway Engineering, and Sustainability and Resilience) with international reputations in various core Civil Engineering areas, including wind engineering, water engineering, geotechnical engineering, highways and railways. The vast majority of staff within the School make a significant contribution to our research portfolio and are allocated to one or more research groups—Fluid Mechanics, Environmental Engineering,

Transport Engineering and Structural Engineering. Our research is supported by core funding and more than £3m research grant income annually, drawn from research councils, the EU and many industrial companies and bodies.

Much of our railway engineering activity is encapsulated within the Birmingham Centre for Railway Research and Education (BCRRE), an inter-disciplinary research centre mainly consisting of staff from the Schools of Civil Engineering and Electrical, Electronic and Computer Engineering, under the direction of Professor Chris Baker. The breadth of civil engineering activity undertaken within this research theme is vast, encompassing aerodynamics, geotechnics, climate resilience, strategic asset management, and structural analysis of railway infrastructure such as bridges and switches.

The School's activity on Sustainability and Resilience has a focus on the long term future of urban environments and the infrastructure which underpins civilisation. Thus, it too cuts across all research groups, taking in extreme wind loads on buildings and other structures; water engineering and river management; mapping underground services; transport and climate studies; and wind energy structures. The School has been particularly successful in recent years in securing some large, high profile multidisciplinary research programmes on Urban Environments and Urban Futures, with co-investigators from a number of other Schools within the University and from other HEIs.

The School of Civil Engineering is rightly proud of its diverse research portfolio. We undertake projects ranging in from just a few thousand pounds for local SMEs, to large multi-million pound initiatives for the European Union and Research Councils

continues on next page



Meet the new staff

Dr Darshan Ruikar



Darshan will be joining the School from Arup where he is a Senior Project Manager with experience in leading the development and implementation of project management and controls systems, and processes within multi-disciplinary teams on large infrastructure and building projects. He has a significant track record in demonstrating innovation in the application of information technologies to support project management teams and project control processes, particularly for project delivery. While at Arup he has worked on a number of high profile projects, including London 2012 and HS2 (High Speed 2). He has also provided guidance for the

implementation of Project Management and Project Control systems to clients such as E.ON, Olympic Delivery Authority and Land Securities.

Before joining Arup, Darshan achieved his PhD in Civil Engineering from the University of Nottingham and then worked as post-doctoral research associate with Professor Chimay Anumba at Loughborough University in the Construction Informatics group. He has a research interest in programme management, project controls and process automation and making the most effective use of project ICT systems throughout the project life-cycle to support their primary drivers; time, cost, quality and safety.

Dr Soroosh Sharifi



Soroosh earned his BSc in Civil and Environmental Engineering and MSc in Hydraulic structures from Ferdowsi University of Mashhad before pursuing his PhD at the University of Birmingham in 2006. After graduation, he joined the Catholic University of America in 2010 to serve as a post-doctoral scholar. In the last 10 years, he has worked on several research projects in the areas of hydrology, hydraulics and environmental engineering.

Soroosh's primary research interests lie in the area of river and environmental hydraulics, rainfall-runoff modelling, multi-objective optimization and inverse modelling. He is particularly interested in how physical and data modelling can be coupled to better understand the underlying physics of hydro-environmental processes. A great deal of his research is focused on the application of machine learning and evolutionary computation methods in water sciences.

continued from previous page

UK; good examples being the Future Resilient Transport Networks programme (FUTURENET, <http://www.arcc-cn.org.uk/project-summaries/futurenet/>), and the Assessing the Underworld programme (ATU, <http://gow.epsrc.ac.uk/NGBOView-Grant.aspx?GrantRef=EP/K021699/1>).

However, regardless of the size, scope and multidisciplinary nature of our

research projects, we are always aware of the need for robust, fundamental civil engineering skills in the core sub-disciplines of structural, geotechnical, water and hydraulic engineering—skills which our staff retain and exploit to the maximum for the benefit of our research programmes. We are hard at work articulating this in our forthcoming REF submission and anticipate that the impact

of these skills on our ability to deliver the highest quality research will be recognised in the process.

If any readers have an interest in our research portfolio and would like further details regarding the School's track record or capability in specific areas, please feel free to contact me for a discussion.



Respect sponsorship goes from strength to strength



For more than 10 years Birmingham has been actively helping its students find relevant industrial experience via the Respect scheme. Jenny Illingsworth, Industrial Liaison Manager, operates this highly popular recruitment scheme each year, together with the ever-growing partnership of employing companies. In 2013, more happy students secured summer placements or sponsorship through this year's recruitment activities than ever before.

Respect comprises a three-stage process: a careers fair (the Meet the Companies event) in November, which most of the students in the School visit; application deadline by Christmas; and an interview day in January. The bustle and opportunities that these two days represent means the scheme is highly popular and very competitive. The preparations the students make for their

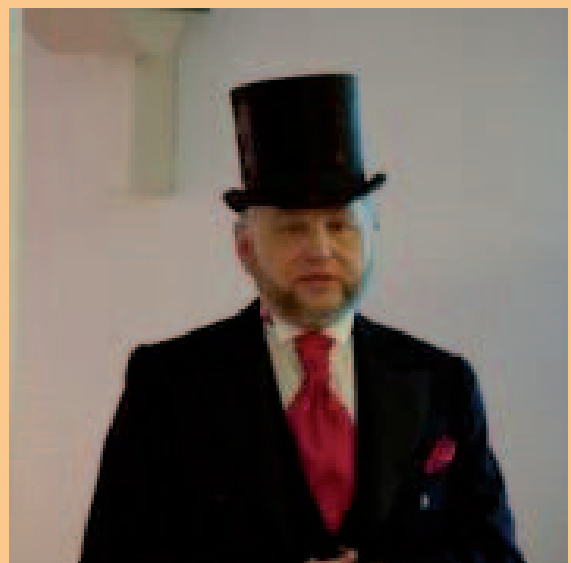
interviews result in employer feedback to the effect that they wish they could find more spaces for sponsored students! In 2013, the majority of the first and second year applied, demonstrating the enthusiasm they have, early in their studies, to make an impact in the field of civil engineering.

Regular recruiters Laing O'Rourke, Balfour Beatty (Regional Civil Engineering and Utility Services), Interserve Construction, Geoffrey Osborne Ltd, Mouchel, North Midland Construction, Arup and Grontmij were joined this year by Atkins and Amey. All are looking for talented young engineers to continue the success of their businesses—of which Birmingham has plenty.

To take part in RESPECT 2014 or for more information for your company, please contact Jenny Illingsworth on j.s.illingsworth@bham.ac.uk.

School hosts international workshop on train aerodynamics

From April 8th to April 10th the Centre for Railway Research and Education hosted an International Workshop on Train Aerodynamics. This was attended by 50 delegates from Europe, China, Japan, Australia and the USA, and represented a considerable proportion of the international railway aerodynamics community. Papers were presented on a wide range of subjects, including the effects of cross winds on trains, the nature of train slipstreams and wakes, the flight of ballast beneath high speed trains and the phenomena of sonic booms being created at the exit of long tunnels. A number of researchers and staff from the School of Civil Engineering presented papers and their work was well received. The Conference Dinner, held at Hornton Grange, was memorable for the after dinner speech given by Mr Isambard Kingdom Brunel and Mrs Mary Heaviside (the former returning from the grave for the first time since the Olympics Opening Ceremony) who both entertained and informed all who were present.



*Mr Isambard Kingdom Brunel,
aka Professor Felix Schmid*



Constructionarium 2013



Constructionarium is becoming a regular activity at Birmingham and this Easter saw a team of 20 students, led by Dr Pedro Martinez-Vazquez and Interserve Construction, successfully built a 1/10th size Ravenspurn Oil Platform in record time. Fitting the activity in between the end of term and Easter meant careful planning by Mohammed Bilal and Tom Davey (Y3 leaders), and Ed Walker (Y2 project manager). The solution was a (very) early start on Sunday 24th March in time for completion a day early, on Thursday 28th, before Good Friday and the start of the Easter break the following day. Not only was the group challenged with time but in the coldest March weather for many years, they discovered that six layers of clothing sometimes wasn't enough! However, with plenty of tea and a determination to succeed, the group of 1st and 2nd year students got to work straight away and completed the build, floating the rig onto its foundations in the lake on time. Mike Wade, Technical Services Manager of

Interserve Construction and the Contractor partner for the Birmingham Constructionarium activity, commented, "The students all seemed to have enjoyed the week (despite the weather, which was very, very cold) and hopefully also gained a learning experience." These comments were echoed by the returning students, who not only have gained experience but have applied some of their academic learning to a real situation.

Constructionarium requires significant industrial support and sponsorship to continue and, without the time and effort contributed by Interserve Construction, it would not be possible to provide this valuable hands-on experience to our students. The School is keen to involve more industrial partners who can sponsor this activity and help the School cover the costs of providing this experience. To join a consortium of Constructionarium supporters, please contact Jenny Illingsworth, Industrial Liaison Manager, on j.s.illingsworth@bham.ac.uk.



School of Civil Engineering Spring Careers Event

The School hosted its first ever Spring Careers Event throughout the afternoon of 21st February and welcomed 18 organisations who were keen to tell students about places available for summer placements, year in industry, further study and graduate jobs.

The doors to the Shell Lounge opened at 1pm and almost immediately the room was full, with a hubbub of conversations, freebies being given out and interested students reading of careers literature. With jobs ranging from engineering consultancies to construction and contracting, temporary works design to energy generation and efficiency, and environmental engineering to project management, there was something to interest every one of the 200 plus students who visited.

Two 'Question Time' sessions took place in parallel to the careers fair, and representatives from 12 of the companies attending took part in one of two panel-style discussions: each person was introduced with a potted history of his or her career to date before telling the audience about their companies and the opportunities they currently have for students and graduates. Thereafter, the students asked questions which ranged from prioritising applications, interview techniques, opportunities for combining research/further study with work, international applications, the route to chartered status and which entry route is best for a PhD.

During the Spring term many final-year and MSc students looking for graduate jobs worry that they are too late to secure a job. The event served to encourage those not yet holding a graduate offer that there are still plenty out there to be considered, and that there is a huge range of career options open to civil engineering graduates. Questions on



international applications and visas were answered with a resounding: if you're the right person for the job, you usually shouldn't have a problem obtaining the necessary work permits for the UK. The challenge is to make a great application—demonstrate your enthusiasm and skills, and show you're the best person for the job!

As the afternoon drew to a close the tea and cakes (kindly sponsored by Hyder Consulting, Atkins and the Midlands Energy Graduate School) reinvigorated everyone and drew in a final flurry of interested students!

To reach students and graduates for your vacancies, please contact Jenny Illingsworth, Industrial Liaison Manager, on 0121 414 4165 or email to j.s.illingsworth@bham.ac.uk. Opportunities exist for sponsorship, placements, graduate jobs, projects and personal mentoring.

The School thanks the following organisations for supporting this first event and we look forward to continuing working together:

AECOM
Amey
Arcadis
Arup
Atkins
Birmingham Employment Access Team
BWB Consulting
Careers Network
Carillion
EDF Energy
C2HM Hill
Hyder Consulting
Midlands Energy Graduate School
Rhead Group
RNP Associates
School of Civil Engineering further study
URS
WillmotDixon



A first for Birmingham: Jointly-awarded PhD

Universitas 21 (U21) is a global network of 24 research-intensive universities from Australasia, the Pacific Rim, the Far East, India, Europe and the Americas. It exists to encourage innovation and student mobility, connecting students and staff across the world. In May 2009, U21 established a unique framework for jointly awarded PhDs in which two partner universities create a tailor-made programme of study for each student, taking individual research needs into account and enabling collaboration with another of the network's universities.

The School of Civil Engineering was one of the first participants in this programme. Dr Michael Burrow and Dr Harry Evdorides co-supervised Megan Schlotjes with Dr Theuns Henning from the University of Auckland, New Zealand. Megan spent 15 months of her 4-year PhD programme at Birmingham, which gave not only access to Birmingham academic expertise, but also the opportunity to experience life in the UK, taking in the Queen's jubilee and the glorious British summer of 2012!

Megan's work has been ground-breaking in the development of an expert system which marries human expertise and computer modelling to develop a sophisticated process capable of predicting the structural failure of roads. To achieve this, complimentary expertise in both groups was exploited and built upon



and all partners have benefited: the academics have cemented their ties in leading research worldwide in the field of highway engineering, and Megan was able to combine her PhD study with overseas experience. She has now completed her research and, upon the successful completion of her viva in summer 2013, will be awarded the first PhD jointly from Birmingham and Auckland. Building on this success and her international experience, Megan has joined the World Bank, where she is working with international governments on projects ranging

from investigating runway pavements and facilitating sustainable energy alternatives, to developing safe and efficient maritime operations.

Megan has the final word on her experience, commenting; "The overall experience further enriched both my professional development in the transportation industry and my personal growth. I look back favourably on my UK-based overseas experience with very memorable achievements both in the academic world and personally."





Outreach—a bridge to the future



In order to enthuse and inspire the next generation of civil engineers the School has now taken delivery of its very own (flat packed) cable stayed bridge. The bridge received its first outing at a School open day and generated significant interest. Secondary and primary school visits are already the planned for next year. The first such outing took place at Our Lady of Fatima's RC primary school in early May and was well received by all. If you know of a school that would benefit from a visit please contact Andrew Quinn (a.d.quinn@bham.ac.uk) or Neil Nelson (n.nelson@bham.ac.uk).

In addition to the above, the School has continued with its lecture programme and have visited:

- Barr Beacon (Drs Burrows and Ghataora)
- King Edward's School (Professor Bridgeman)
- Queen Ethelburgas, York (Professor Sterling)
- The Warwick School, Warwick (Professor Bridgeman)

Flood Resilient Cities—Clark lecture 2013

Wednesday 1st May 2013

This year's exciting Clark lecture was delivered by David Balmforth who is an Executive Technical Director with international consultants MWH. David gave a thought-provoking lecture on the future of flooding and presented a number of challenges to the audience.

At MWH David has particular responsibilities for flood risk management, water pollution control and climate change adaptation. Currently his work ranges from advising governments on managing flood risk to delivering flood alleviation and pollution control schemes for the major UK water companies. He has worked previously as a County Council engineer and as an academic, and has established an international reputation for his work in urban drainage. He is a visiting professor at Imperial College London, and Editor of the Journal of Flood Risk Management published by CIWEM and Wiley Blackwell.

David has a long association with the Institution of Civil Engineers in a number of capacities. He was responsible for implementing regionalisation and establishing a regional support team in the Yorkshire and Humber region during his year as Chair. From 2003 to 2006 he served on the Editorial

Panel of the Water Management Journal. More recently, as a member of the Water Panel, he represented ICE on the Pitt Review and chaired the Flooding Life Panel responsible for producing the 'Flooding State of the Nation' Report in 2008. He currently chairs the Inter-Institutional Panel on Flooding on behalf of ICE.

David was elected to the ICE Council in 2007 and to the Executive Board in 2008. He was elected as a Vice President from November 2009. He currently chairs the Learned Society Committee having previously chaired the International Policy Committee for two years. His vision is for civil engineering to be recognised as a high value profession and for the Institution to be referred to and trusted by the public, politicians and policy makers in the UK and overseas.

The Clark Lecture is in honour of Emeritus Professor Leslie Clark, who joined Birmingham in 1978 as a lecturer, and retired in 2009 as Head of School, and Pro-Vice Chancellor of Estates and Infrastructure, picking up a wealth of awards and publishing a volume of papers along the way.

If you would like to be kept informed about future Clark Lectures and other events in the School of Civil Engineering, please contact Ms Gaby Howell with your contact information. Gaby can be contacted on g.j.howell@bham.ac.uk or 0121 414 5137.



£5.9 million to assess the underworld



The University of Birmingham will receive one of four large grants as part of a multi-million pound investment in leading engineering research projects was announced by Minister for Universities and Science, David Willetts on 12th March 2013.

The minister announced a £47m investment for five frontier engineering projects and four large grants to UK universities at the first Global Grand Challenges Summit in London. The investment will support new innovative engineering projects and an international partnership between the UK and US bringing leading engineers and scientists together to address some of the major engineering challenges facing the world.

A £5.9m grant has been awarded to Professor Chris Rogers for *Assessing the Underworld – an integrated model of city infrastructures*, a project which looks at transforming how street works are carried out and improving the management of assets under the ground. In collaboration with academics from the universities of Bath, Leeds, Sheffield, Southampton and Newcastle and NERC British Geological

Survey, this project is supported by institutions in Australia, Brazil, New Zealand and the US among its 63 partners. Key players in utilities, construction, sensing and mapping have pledged an additional £17m support in cash and in-kind contributions.

The Global Grand Challenges Summit is organised by the Royal Academy of Engineering with the support of the Engineering and Physical Sciences Research Council and other partners.

The University of Birmingham joins Imperial College London, University of Dundee and the University of Edinburgh to receive one of four large grants totalling £20m, which will go to projects that match the Summit's themes of Resilience, Health, and Technology & Growth. They will develop new diagnostic tools and therapies in health, explore the use of hexagonal structures in

technology, and improve urban infrastructure planning and modelling. In addition, five Frontier Engineering projects will receive £25m in total, the successful applicants cover a range of topics that align with the themes of the Global Grand Challenges Summit.

Professor Chris Rogers said: "Utility services provide the life blood of cities, providing the wherewithal for civilised life in cities to be supported. They are typically buried beneath our urban streets meaning that they are vulnerable to damage, while we are vulnerable to traffic congestion, when we need to add to, repair or maintain them using traditional, trenching, methods. By using shallow-surface geophysics – Time Team for the streets, if you like – we will explore the structural condition of the buried pipes and cables, the ground in which they are buried and the road structures that overlie them, and this will inform the types of (trenchless) technologies that might be used"

David Willetts said: "Over the last two centuries engineering innovations have transformed lives, but we still face global challenges like tackling climate change, improving healthcare and meeting basic needs, like access to clean water. This significant investment recognises the vital role that the UK research base can have in providing solutions to these challenges."





Engineers without Borders—A successful first term



Engineers without Borders (EWB) are gearing up for a second term of activities and events after a great first term. Affiliated to the national charity, the society is one of the many student branches across the UK hoping to raise awareness and to encourage people to consider a career in international development. We are not just for engineers!

This year's Engineering Design module being run for second year Civil Engineering students has an international development theme to the project (as well as the chance to compete in the EWB Challenge), which has boosted turnout to Monday

night meetings—especially for a talk on bamboo structures that was connected to the module. But no matter the reason for coming along, the aim is to get more people involved and so it is with great excitement then that the second term commences for the Birmingham branch.

Already the programme of events is looking to be as successful as last term; there will be a visit from the CEO of EWB, Andrew Lamb, to launch the upcoming summer placements, plus a chance to make bioplastic out of potatoes. Not to mention that many of our members are now STEM ambassadors and are keen to take the EWB Outreach programme to local schools to encourage and enthuse school children of a range of ages about engineering, and the good that it can do for developing countries.

We are always happy to welcome new members, both students and staff: You can find us on Facebook [Engineers Without Borders Birmingham](#), where you can also find this terms event calendar.

You can find more information at www.ewb-uk.org/birmingham and <https://www.facebook.com/groups/EWB.Birmingham/>.

Knot your average junction

Dr Nicole Metje participated in the unveiling of a plaque to commemorate the 40th anniversary of the opening of Spaghetti Junction as part of her work on the ICE Municipal Panel in December 2012.

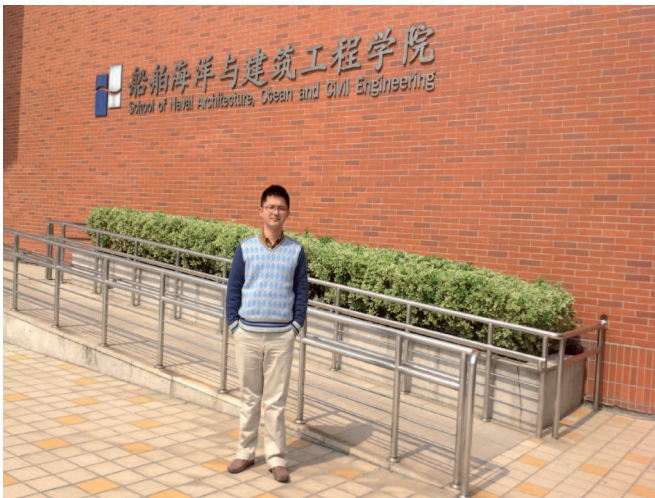
Its official name is 'Gravelly Hill Interchange', but due to the number of intersecting traffic lanes, the structure was referred to as 'Spaghetti Junction' in 1965 by journalist Roy Smith, who said the blueprints looked like "a cross between a plate of spaghetti and an unsuccessful attempt at a Staffordshire knot." That name has stuck and passed into common usage. The designers of Midland Links had to build a six-lane carriageway and link roads through several built-up areas, but with the minimum demolition and disruption. To achieve this, the M6 and Spaghetti Junction follow the line of the local canal and river network on elevated sections. In an interesting meeting of old and new methods of transport, the pillars carrying Spaghetti Junction over the canal network had to be carefully placed to allow a horse-drawn narrow boat to pass underneath without fouling its towrope.

Construction started in 1968 and took four years to complete. Spaghetti Junction has 559 concrete columns, some reaching 80 feet high. The first motorists used Spaghetti Junction on the 24 May 1972. It cost £10m at the time of its construction and involved 13,000 tonnes of steel reinforcement and 134,000 m³ (175,000 cubic yards) of concrete. Routine repairs to the reinforced concrete structures have been ongoing since the late 1980s. Regular maintenance includes the replacement of expansion joints, painting of steelwork, the clearing drainage channels and gutters, clearance of vegetation and removal of graffiti.

Spaghetti Junction appears in the Guinness Book of World Records, as "the most complex interchange on the British road system". During the first year of opening, the average flow of vehicles was 40,000 per day. Today, the average daily flow is over 210,000 vehicles. In its 40 year history, it has carried nearly two billion vehicles.



A view from China



Dr Jimmy Yang, Lecturer in Structural Engineering, writes...

I am currently undertaking a sabbatical at the Shanghai Jiao Tong University (SJTU) thanks to a grant from the 1000Plan run by the Organization Department of the Central Committee of the CPC. SJTU is within the top six in the 985 Chinese Universities Consortium consisting of 34 tier one universities and is ranked between 50–75 in the world for its engineering/technology. The Department of Civil Engineering belongs to the School of Naval Architecture, Ocean and Civil Engineering, which also hosts the State Key Laboratory of Ocean Engineering.

The overall aim of this research visit is to accelerate my research development by having access to SJTU's state-of-the-art research facilities as well as fostering collaborations in both the research and teaching exchange. During the visit, I have managed to arrange for four of my PhD students to spend between one and six months in SJTU to strengthen their research work. My research interests concern light steel/precast concrete structures for off-site constructions and sustainable buildings.

Research

With the support of this grant, I have built a 12x2.5x1m modular vacuum loading chamber, which, I believe, is the world's largest loading chamber used in a laboratory. By using this loading chamber, I have been able to conduct full-scale roof assembly tests

by applying uniformly distributed loads (UDL). The UDL is the true representation of the wind load and produces better effects than the multiple-points loading tests that I have undertaken before.

So far the work has led to a joint paper submitted to the journal of Engineering Structures.

SJTU has impressive Structural Engineering labs. SJTU also hosts a green building test centre, where a lot of research on renewable energies is conducted. The collaborative work I have undertaken in this area has also led to a journal on the structural performance



UoB PhD students visiting SJTU

of glass. During my visit I was luckily enough to attend a Sino-UK forum on Sustainable City Development in Chongqing, which was a real eye opener.

As mentioned above, the State Key Laboratory on Ocean Engineering has some of the most cutting edge lab facilities including the world's second largest 4,000m deepwater tank capable of performing wave, wind and current simulations. To utilize this facility I bid for and won a competitive grant which enabled work on the "performance based design of concrete wind turbine tower considering the degradation effects caused by corrosion and fatigue" to be undertaken. Using this grant, I recruited a final year SJTU student to carry out pilot work and this has enabled him to prepare an EPSRC grant proposal together with



Vacuum loading chamber



A view from China...continued



Laboratory tests on the edge seal of double glazing units

Professor Baniotopoulos.

I am also working to nurture international research collaborations in Civil Engineering between two universities at the staff level. Dr Ling and Dr An will be invited to give research seminars to SJTU staff. Dr Ghataora and Professor Schmid have also expressed interests in visiting SJTU to extend their endeavours on research collaboration, admission and joint degree provisions.

Teaching collaboration

Since last September I have been working to facilitate a joint degree provision agreement for civil engineering between the two institutions. It is now reaching the final stage before signing. Hopefully, it can start with this year's new students. In addition to SJTU, I have also visited Wuhan University of Technology (WUT) and Beijing University of Technology (BUT) with a view to setting up similar agreements.

I have been actively promoting our Civil Engineering programmes in China and so far, three students have applied for our MSc or MRes programme, one of them has been admitted and the other two are still in the application process. I have also recruited two strong candidates for our PhD programmes.

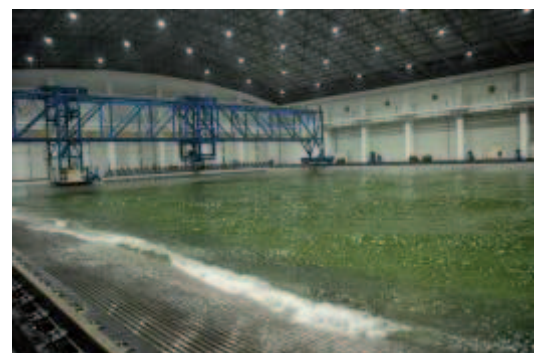
Comparisons of teaching between two institutions

All BEng courses in SJTU require four years; in the first two years students will attend the general science and engineering related modules across the School, and at the end of year 2, students choose their subjects. There is a special variant of the civil course, called the Excellent Engineers course for Civil Engineering, which almost 50% of students opt for. This course is similar to our Civil Engineering with Industrial Experience. Students on this course will be admitted to their Masters course (2.5 year) without the need for attending the national entrance exam. Each student will be partnered with an academic and an industrial tutor from year 2, who will jointly formulate their training plan and monitor their progress on an individual basis. The student will be heavily involved in individual academic research and engineering practice throughout their study. Only a few universities have been selected to trial this model.

Another successful trial on the undergraduate teaching side are the student-led research activities. Each year, there are several calls encouraging students to bid for research grant (£5k–10k).

The bidding process is similar to the formal bidding process, e.g. forming a research consortium (including at least one academic staff's support) and writing research proposals; judging panels will select winning bids to award the grants. Students who participate in these activities will receive not only financial support, but also receive equivalent credits subjected to a standard assessment. This type of trials have proved very useful as evidence by high quality journal papers that students have published before they graduate with BEng degrees, or the competitions they have won at both national and international levels. Also the students' research ability can be cultivated early in their undergraduate studies and will help them to continue research work.

Last but not least, I would like to thank the University of Birmingham for granting me this leave and SJTU for providing the financial support and opportunities. I see the benefits gained from this process to be more of a long-term nature.



Deep water lab in SJTU



Class of '62 reunion



Martin Gilliam, alumnus, writes...

The CivEng Class of 1962 held its fourth Reunion on 28–29 September 2012 at the Hornton Grange.

The first reunion was held in April 1985 with 10 graduates attending the 17th Reunion Dinner of the Civil Engineering Graduates Association Dinner in the Students Union, Edgbaston, the next in 1999 based upon University House and the third in September 2003 at Churchill College in Cambridge.

The format for the most recent reunions has been similar: meeting for lunch and drinks, tour/discussions in the civil engineering department, semi-formal dinner and depart after breakfast the following morning. We have invited as guests for the dinner the current Head of Civil Engineering and a former lecturer of ours Professor Mike Hamlin.

The purpose of the reunions has been entirely social with of course much reminiscing. No doubt if we had organised reunions 10–20 years after graduation there would have been technical and commercial networking potential. It is not known how many other classes (Civil Engineering or otherwise) hold

such reunions but it would be interesting to find out. All that can be said is that all participants seem to enjoy them and our next is already 'pencilled in' for 2017.

Some 'facts' about our year, which may be of interest: We were perhaps the first year that did not have the prospect of two years National Service hanging over us as this was abolished in 1960. We commenced in October 1959, when 3% of the age cohort went to university, with approximately 55 students (all male) and graduated in June 1962 with 42:

4 Class 1	13 Class 2.2
9 Class 2.1	16 Ordinary

In 1959, the CivEng Department was located on the lower levels under the Great Hall. We moved to a 'new' purpose built building in 1960. This new building has in recent years been converted for the Sports Sciences Department, while Civil Engineering was moved and now occupies part of the former Mechanical and EECCE building although the laboratories remain in the original position attached to the 1960 new building.

In the new building we each had a desk in a drawing office-type arrangement (with the number of desks allocated for

the final year being less than for previous years!) and we were arranged alphabetically (I sat next to Keith Gibson...and we have by chance been friends ever since. I was lucky as I was often able to make changes to my exercises after discussion with Keith.)

As a class and with hindsight we had a fine esprit de corps engendered perhaps by quite a high workload (compared with many students), by the annual Geology and Surveying 'Camps' and membership of many in the University Air Squadron, both flying and airfield construction branches and its related overseas Annual Working Trips (we went to Cyprus twice). Ten of us also went on as five-week trip to Greece in an old army lorry immediately after graduation, which cost us in all £334 including the lorry and fuel!

There was an idea before graduation that the thing to do was to spend two years with a contractor, two with a consultant and two with a public authority, however in practice no one did that! We were obliged to spend 4–6 weeks in each summer vacation on work arranged by the Civil Engineering Department (I spent both of mine with contractors, which put me off such type of work!). Our starting salaries were about £500–750 a year. While many became involved with the UK road building programmes of the 1960s and 1970s in one role or other, one became a V bomber pilot!

We worked with slide rules and log tables, although room size computers were appearing in early 1960 (I spent many hours operating a Sirius Room computer calculating earthwork quantities for new canals in Iraq in 1962/3!).

CivSoc would like to thank that class of 1962 for their generous donations which enabled them to undertake a number of site visits and outreach activities this year.

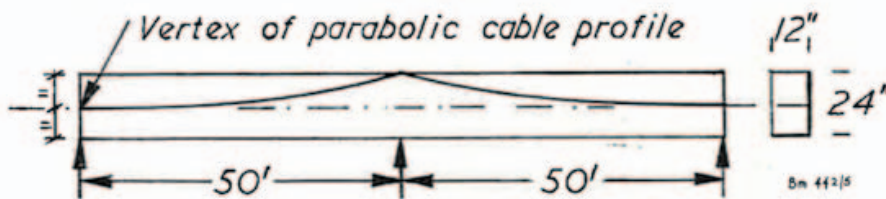


Class of '62 reunion...continued

And finally, the class of 1962 have kindly supplied some past examination papers so you can test knowledge. Answers on a postcard.....

5. A two-span continuous beam is stressed by the cable shown in Fig. 5 with a pull of 200,000 lb. Calculate the instantaneous fibre stresses and deflexion at midspan. Assume that concrete weighs 150 lb. per cu. ft. and that E is 4×10^6 p.s.i.

Concrete Engineering
(1 June 1962)



Civil Engineering
(5 June 1962)

7. (a) What factors have to be taken into account when making a choice between rapid gravity filters and slow sand filters if the water to be treated comes from a polluted river source?

(b) Under what circumstances would micro strainers be acceptable as an alternative to or in addition to sand filtration in the water purification process?

(c) Derive expressions for the expanded depth of a rapid gravity sand filter during backwashing and the corresponding head loss.

Hydraulics and Mechanics of Fluids
(2 June 1962)

1. A sudden increase in depth in a horizontal rectangular channel causes a positive surge wave to move upstream with a velocity c . The velocity and depth of flow upstream of the surge are v_1 and y_1 respectively and these quantities downstream of the surge are v_2 and y_2 respectively. Show that

$$v_1 + c = \sqrt{gy_1} \left[\frac{y_2}{2y_1} \left(1 + \frac{y_2}{y_1} \right) \right]^{\frac{1}{2}}.$$

Hence derive an expression connecting the depths of flow upstream and downstream of a hydraulic jump.

If a hydraulic jump occurs in a rectangular channel of 8 ft. width from a depth of 1 ft.-6 in. what will be the depth of the flow after the jump if the quantity of water flowing is 150 cusec.

Make a donation

If you wish to donate to the student run society, CivSoc, in order to enable more site visits and outreach activities, please go to www.birmingham.ac.uk/alumni/giving, select 'Make a gift', and choose 'Civ Eng 1962 Class Gift' from the designated list. Thank you.