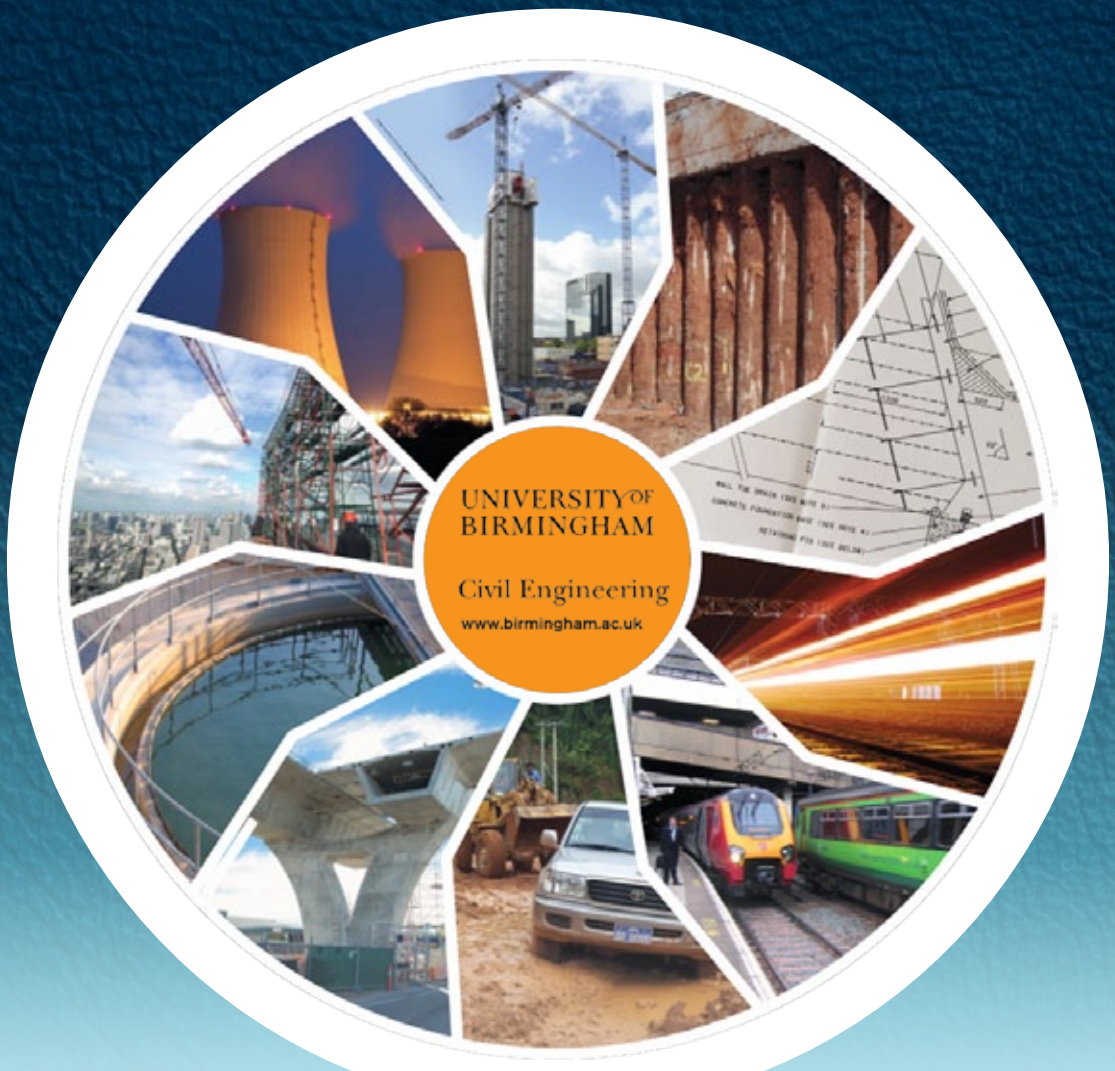
College of Engineering and Physical Sciences

University of the Year 2013-14

Athena SWAN Bronze Award

School of **Civil Engineering** NEWSLETTER 2014



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Editorial

Professor Mark Sterling, Head of School writes…

They call it the windy city and before I even stepped foot off the airplane I realised why. Bad weather had delayed touch down and when the airplane suddenly descended without warning, it provided a useful reminder of the turbulent nature of the wind (theory is often much nicer than practice). When I finally managed to clear US customs the taxi driver told me of the tornado which had struck in Illinois only a few hours previously (**http://www.weather.com/news/tornado-central/midwest-tornado-outbreak-20131118**); my grumbles about the last part of the journey disappeared quicker than our airplane had descended. There appears to be some phenomena occurring in tornados which we do not fully understand, since for many tornados the level of damage tends to exceed what one would normally except with such wind speeds. Although significant, the damage associated with this event is dwarfed when compared to the recent devastation arising as a result of Typhoon Haiyan. At such times I am reminded of the contribution that Civil Engineers make to society and I find myself reflecting more and more on the possible contributions our students will make in the future.

In a round about way, tornados and typhoons were related to my visit to Chicago; I was attending a conference titled *Global Urban Challenges: The Role of Research Universities* on behalf of the University. Normally I shy away from such events since they tend to be very general in nature and as a consequence not of interest to my research but, I was asked to attend by someone who has (significant) influence over the School while at the same time given an appropriate amount of flattery, so it was a relatively easy decision to make! The conference was an eye opener in terms of the complexities of the challenges facing cities as we move forward. Did you know that the United Nations have projected that by 2050, approximately two-thirds of the world's populations will be living in cities? The conference focused on three themes: urban health, urban education and urban planning and was organised by the Chicago Council on Global Affairs, North Western University, The University of Chicago and the University of Illinois. As with other events of this nature, it was the conversations and contacts made outside of the sessions which were most stimulating and potentially useful. I also had the opportunity of meeting undergraduate students from all three Universities and was impressed by their enthusiasm, drive and international outlook. The latter is something that I have noticed happening at Birmingham. We are of course used to providing a diverse and international environment for our students but I have been surprised this year at the number of students wishing to broaden their horizons and spend a year abroad. Such mobility is good news for the UK and will help us maintain its international competitiveness.

Continuing with the theme of student mobility, I encourage you to read the two articles by Joanne Maguire (president of Civ Soc) who spent last summer in Cameroon. Since returning Joanne has helped train students from Birmingham (and Coventry University) and I know that the University's Engineers Without Borders society has great things planned for the future. Staying closer to home there is also an article by one of my personal tutees, Elton Yan. Elton told me of his story and I felt it was appropriately inspiring.

It is not just the students who are spreading their wings but also the staff. I am pleased to report that Prof Chris Baker will be seconded to the Transport Catapult on a part time basis for 12 months. This secondment is high profile for the School and helps us to demonstrate that we are leaders in the field. On the back of this opportunity we will also be looking to strengthen our academic base further and together with Colleagues in Electrical, Electronic and Computer Engineering we have chosen to significantly expand the Birmingham Centre for Railway Research and Education. In education terms, this expansion will result in a Civil Engineering and Railway Engineering undergraduate degree and two further MSc degrees. In staff terms, we envisage the appointment of an additional two professors, two lecturers and two research staff spread across both Schools.

The School also has plans to launch a new MSc in Structural Engineering and Practice. Over the last few years we have been surprised at the number of people wishing to undertake a higher degree in this area. However, we have also been surprised at the number of people who are prevented from doing so because of their current financial situation. In order to address this point the School is seeking to raise £300,000 for scholarships, which would provide the appropriate level of resource to provide fee free education for five students for the next 10 years. We would very much value your help to achieve this target and if you are able to contribute please contact Ms Kathryn Chedgozy (**k.a.chedgzoy@bham.ac.uk** / 0121 414 9037) who will be more than happy to guide you through the process.

The very large TV which dominates my hotel room now informs me that there were seven tornados in 'Chicago land' overnight. Over the summer I submitted a bid for Research Council funding to work with colleagues in America in order to investigate such phenomena and to build a large-scale tornado generator at Birmingham. Time will tell if this bid is successful. Did you know that England apparently has more tornados per unit area than any other country in the world?

Mark Sterling

(in the early hours in bland hotel room in downtown Chicago, still waiting for his body clock to adjust to local time)

Opening Up International Tracks in Civil Engineering - growing railway activity in Asia

Prof Richard Williams writes…

Civil Engineers have always worked in a global context. Recently the global shortage of talent in railway technology, engineering and management has created a range of distinctive opportunities for the School of Civil Engineering and colleagues from other schools working with The Birmingham Centre for Railway Research and Education.
The last twelve months has been marked by an explosion of international opportunities relating to railways education, research and consultancy. This embraces all activities from design, environmental assessment, materials technology, energy systems, communications, signalling, maintenance and asset management and safety etc. In this sector there has been a longstanding relationship with China and the University through the Beijing Jiaotong University and now emerging relationships activities in the cities of Hefei, Hangzhou and Guangzhou. Asia is not unique in experiencing simultaneous demand for high-speed, metro and light-rail within literally dozens of cities – but it represents an order of magnitude of demand that has not been seen hitherto. Strong demand also persists in South America and, for passengers, in North America.

A few weeks ago I had the pleasure of visiting our new research centre in Hefei and signing off the agreements to develop a range of activities there.

Figure 1: Anhui-Birmingham International Research Institute in Rail Transportation

This is a major project lead by Professor Clive Roberts (School of Electronic, Electrical and Computer Engineering) for the Birmingham Centre Railway Research and Education working with the Anhui Municipal Government, located in the city of Hefei. Such 'relationships' are just that - they arise from a number of personal interactions extending over years, or from an earlier educational contact or alumnus. Having passed the trust criteria the project has evolved to take the shape of substantial building (complete with chef and accommodation) located alongside the China High Speed Rail authority. The institute is temporary whilst new facilities are under construction. For Anhui Province there is an urgent need to attract and retain talent to manage the 23 cities where railway work has or will start. The form of the initial arrangement with the Province is to provide research space and facilities for the University to use and a minimum threshold level of research training (PhDs). In this way mutual benefits can be derived. For the University this is an example of building our reputation internationally, growing our research capacity and capabilities (but at another location), increasing PhD intensity and driving up the number of academic internationally authored papers.

Meanwhile a few hundred miles west, in the city of Hangzhou, this year sees the start of our first overseas taught Masters Programme in Railways Safety, this is funded by the Lloyds Register Foundation. Then in southern China in the city of Guangzhou a new relationship with Guangzhou Metro has been initiated with work on metro and light-rail – this comes out of the special relationship between the cities of Guangzhou and Birmingham under a funding arrangement with the city government there. Over the year ahead we expect to see major growth in this area to celebrate the start of our new undergraduate degree programmes in Civil and Railway Engineering. The railways sector will be important for UK civil engineering consultancy base and aspects of the supply chain and we hope the University will play a strong role in securing such opportunities for our graduates, staff and industry.

New Undergraduate programmes:

The School is proud to announce the launch of its new undergraduate degree programme: B/MEng in Civil and Railway Engineering

Focus on Transport

Railways

By any measure the Birmingham Centre for Railway Research and Education, and interdisciplinary centre mainly consisting of staff from Civil Engineering and Electrical Electronic and Computer Engineering, has been very successful over the last few years. From 2008 to 2012, the number of person tuition days delivered to Masters and CPD students rose from 1500 to 2300, with an increase in income from educational activities from £300k per year to over £800k per year. Over the same period the number of MRes, MPhil and PhD students has risen from 21 to 48, and the rolling three year grant income from just under £1m to just over £2m per annum. This growth has forced staff in the Centre to develop a fully costed and realistic vision for the future, and on the basis of this vision, the University has decided to give the Centre considerable investment. The plans for the Centre can be summarised as follows.

- Consolidation and protection of the recently expanded level of baseline activity
- Running of railway undergraduate minors in Civil Engineering and Electrical Engineering from 2014 – BEng and MEng degrees in Civil and Railway Engineering and Electrical and Railway Engineering
- UK delivery of the new Railway Risk and Safety Management MSc, currently being developed for a University in China, from 2014
- Development and delivery of a new Railway Infrastructure Asset Management MSc from 2015
- The establishment of the Birmingham International Railway Institute that will allow further development of the Masters and CPD portfolio
- A 50% Increase in Railway Research income by 2020, and a 50% increase in PhD student numbers
- Securing a position as a key stakeholder in the development and future operation of the major Rail Technology and Testing Centre that is being developed in Warwickshire

To enable these plans to be achieved the University has agreed to provide the following resources.

- 2 Professors, one in Civil Engineering and one in Electrical Engineering
- 2 Lecturers in Civil Engineering
- 2 'Railway Fellows' in Electrical Engineering
- An additional 2 Teaching Fellows for one year to develop the new MSc programmes and the International Academy.
- An administration assistant
- A Research Programme Delivery Manager
- Extension of the post of the current Rail Research and Education Development Manager
- Significant cash resources for accommodation development, laboratory development and for marketing and travel for the International Railway Institute

These plans and the associated investment will lead to a massive development in the work of the Centre and will further enhance its position as one of the world leading centres for research into railway engineering and technology. The Centre will be in an excellent position to take advantage of the large increase in funding for applied research in the rail industry from the Enabling Innovation Fund, the Technology Strategy Board, and the new EU Shift2Rail programme. These are exciting times indeed.

Chris Baker, Director BCRRE

(Those interested can find further details of the work of the Centre at

http://www.birmingham.ac.uk/research/activity/railway/index.aspx.)

Roads

Road Management Training at International Level

For more than thirty years the highways group of the University of Birmingham has been offering taught and research programmes in the area of road management and engineering designed to equip participants with the skills and knowledge of management procedures for the planning, appraisal, design, construction and maintenance of road networks. The programmes are relevant to conditions found in both developed and developing countries and are suitable for professionals who want to pursue a career in the road sector. The core of these training and research activities has been the world renowned MSc Programme in Road Management and Engineering, an exemplar MSc programme that has stood the test of time since its introduction in the late 70's with funds from the then Overseas Development Administration (currently Department for International Development). The work of the group in the area of road asset management is recognised by the Department for International Development and international banks including the World Bank, the Asian Development Bank, the African Development Bank and the Caribbean Development Bank.

The 2013 Senior Road Executives Programme (17-29 July 2013)

Over the last sixteen years, the Senior Road Executive Programme (SRE - **www.sreprogramme.org**) has provided continuing professional development for senior professionals working in the road sector and, by so doing, contributed to the dissemination of knowledge and expertise and facilitated the implementation of modern approaches to the management and financing of road networks world wide.

The SRE Programme is a self-financing programme run by the University of Birmingham in collaboration with the Geneva office of the International Road Federation (IRF). It was originally developed and financed by the World Bank which still supports it in kind. It consists of four linked, 3-day, intensive residential courses delivered by experts of international repute. The course is directed by Drs Harry Evdorides and Michael Burrow, and Ms Gaby Howell is the programme's senior administrator.

The programme covered four topics: Road Sector Reforms led by Dr Evdorides, Road Financing led by Mr Adam Andreski – a leading expert in international road development, Road Safety led by Dr Evdorides and Road Maintenance Management led by Dr Burrow. They addressed the main building-blocks which are vital for roads to be sustainable, namely:

- Establishing responsibility through regulatory and institutional reforms
- Providing adequate, stable and continuous financing
- Introducing appropriate engineering, educational and enforcement measures to improve road safety
- Applying fundamental asset management principles and appropriate technology for road maintenance.

Four site visits were organised (one for each module) at the Birmingham City Council to discuss the Birmingham PFI project, at the M6 Toll road, at Coventry to see the innovative road safety design approach of newly redeveloped urban roads and at the premises of highway consultants URS in Nottingham to demonstrate advanced road condition assessment equipment and methodologies.

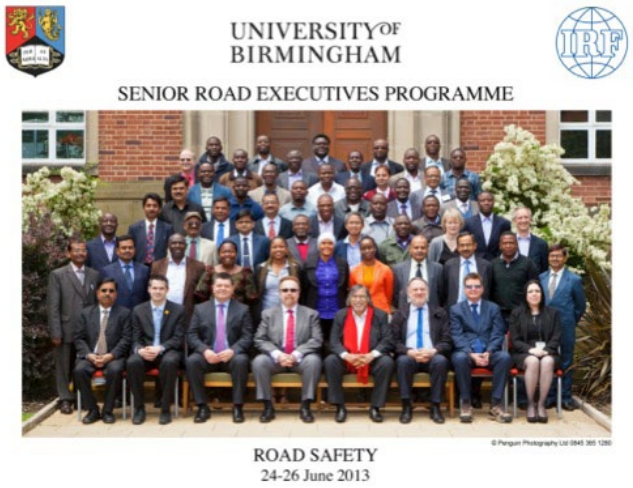


Figure 2 2013 Road Safety module photograph

50 delegates on average attended each of the four modules. The delegates came from Nigeria, Zambia, Uganda, Kenya, Cameroon, India, UK, Namibia, Tanzania, the African Development Bank, the Department for International Development (UK) and the Caribbean Development Bank.

The 2014 SRE programme is being planned between 23 June and 5 July 2014.

The iRAP and HDM4 courses in road safety and road economics

Following the success of the SRE programme, the University offered two new hands-on courses in the areas of road safety and road economics. The first was delivered in collaboration with iRAP (**International Road Assessment Programme** - **www.irapnet.net**). The second was provided in collaboration with **HDMGlobal** (**www.hdmglobal.com**). Both courses were 5-day, intensive and practical residential programmes and led by Dr Harry Evdorides. Miss Sarah Williams, provided the administrative support.

The courses were aimed at road sector professionals, road engineers, planners and road safety professionals who want to be exposed to cutting-edge established methodologies in road safety management and road economics.

The iRAP course - 2-6 September 2013

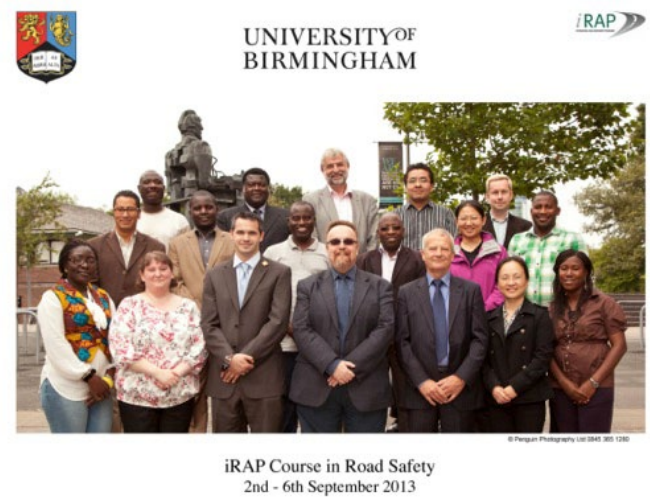


Figure 3 2013 iRAP course photograph

The International Road Assessment Programme (iRAP) is dedicated to preventing the more than 3,500 road deaths that occur every day worldwide through the provision of technology and support that will build and sustain national, regional and local capability in the area of road safety. The iRAP course provided training in the area of road infrastructure safety engineering covering a number of concepts included in pillars of the Decade of Action for Road Safety. It introduced the iRAP technology for evaluating the safety impact of road infrastructure including:

- Risk Mapping existing roads using crash data
- Star Rating existing roads using inspection images and data
- Star Rating the design of new and rehabilitated roads from plans
- Prioritising Safer Road investment plans
- Safety Performance Tracking roads

The course included case study work using the iRAP methodology and software.

The iRAP course was delivered jointly by Dr John Mumford, iRAP's International Director, and Mr James Mumford, International Operations Manager. The course attracted 14 participants from a number of countries including Finland, the Netherlands, Zambia, Nigeria, Ghana, China, Kenya and Mexico. It was the first time that such a course was organised at the University following discussions between Drs Mumford and Evdorides as part of a growing collaboration between the University and iRAP.

The HDM4 course – 9-13 September 2013

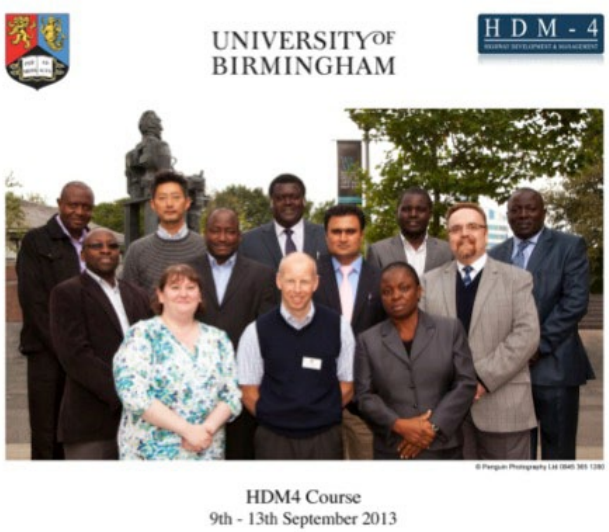


Figure 4 2013 HDM4 course photograph

HDM4 is the world standard in the economic assessment of road maintenance and development projects, originally developed by the World Bank and currently owned by PIARC (World Road Association). The HDM4 course, re-introduced in 2013, was designed specifically to meet the needs of the industry in the area of road management and financing. Participants in this course came from the overseas public and private road sector including road managers, planners, engineers and consultants. The course provided training that promotes the significance of road economics, road financing and the use of HDM4 as the most comprehensive decision support tools in road economics and financing. It covered the following topics

- Overview of where HDM-4 fits within the Road Management cycle
- Overview of the HDM-4 analysis framework
- Introduction to Project, Programme and Strategic Analysis using HDM-4
- HDM-4 Integration with external systems

The course included practical demonstrations and delivered by Dr Eric Stannard, CEO of HDMGlobal. The 9 course participants came from the UK, Zambia, Kenya, Nigeria, Afghanistan and a senior economist from the European Bank for Reconstruction and Development.

Both courses will be offered again in September 2014.

University Developments

The University is investing £175 million over five years to transform our famous Edgbaston campus with new facilities that will be for the benefit of students, staff and visitors. Following extensive public consultation, the estate development plans will deliver the city's first 50 metre swimming pool, create an outstanding academic library with a cultural hub and open up a striking green park at the heart of campus.

Figure 5 An artists impression of the new library

The University's new library will provide improved opportunities for community access to our vast University collections, and cultural heritage. The new facilities, overlooking the 'green heart' will embrace new and emerging technologies for an enhanced user experience, and provide a more efficient use of space, energy and staff resource. The 'cultural gateway' will be a space that can showcase our cultural collections and open up access to all. The new library development will provide our students and the local community with outstanding facilities, as well as an open access 'cultural gateway' for the University and the city of Birmingham. The building will be a step towards the ability to offer our users a 24/7 experience.

The library and 'cultural gateway' will provide the University with increased opportunity for community engagement. It will act as a place in which we can showcase the University's vast library collections and cultural collections, and our creative and research outputs.

SPORTS CENTRE

Figure 6 An artists impression of the new sports centre

The new sports centre is planned to sit on the corner of Bristol Road and Edgbaston Park Road. It will be a large multi-sport facility for students, staff and the local community, and will include the city's first 50-metre swimming pool. We anticipate that the centre will cater for around 3,000 community and alumni members, as well as community clubs and groups.

The new sports centre will not only incorporate the city's first 50-metre swimming pool but also;

- a large sports hall
- activity/dance studios
- a large gym
- squash courts
- a purpose designed Performance Centre and Performance Gym

It is intended that the new sports centre will provide specialist expertise and support to talented sportsmen and women in the University, city and region, which will help us to produce future elite athletes and Olympians.

Not only will the Centre cater for elite athletes but also for the needs of our students, staff, alumni, community and range of community clubs. The centre will offer a wide range of programmes and classes, including a choice of up to 200 fitness/sport classes and a learn to swim programme for all ages.

Our new gym (which will be one of the largest in the United Kingdom), will cater for a wide range of fitness needs from rehabilitation from injury/illness, various disabilities through to competitive players and elite performers.

STUDENT HUB

Figure 7 An artists impression of the student hub

The Student Services Hub will see part of the interior of the main Aston Webb Building remodelled to house a number of different services including Employability, Student Support and a 250-seat lecture theatre. This facility will bring together many student services in one place greatly enhancing the student experience here at Birmingham.

The new hub will also house a new student enquiries reception and information zone, as well as a suite of consultation rooms for one-to-one confidential appointments.

Thank you!

Circles of Influence: Shaking Table

Following a successful application to the Alumni Impact Fund 2013 the School purchased a bench-scale shaking table which is helping us to enhance our capabilities to undertake novel research, prepare new teaching material, and to show our visitors some interesting aspects of civil engineering practice. This devise can be used to simulate and monitor the dynamic performance of infrastructure when is subject to earthquakes. It has integrated data recorded during historical seismic events such as El Centro (USA, 1940), Northridge (USA 1994), and Kobe (Japan, 1995), amongst other utilities. The new equipment was quickly setup to be demonstrated during the most recent outreach activities aiming at increasing awareness of the risks that such natural events can represent to society as well as to generate discussions that involve staff, existing, and prospective students, which has proved to be effective in helping to enrich the atmosphere in our community and to promote public engagement.

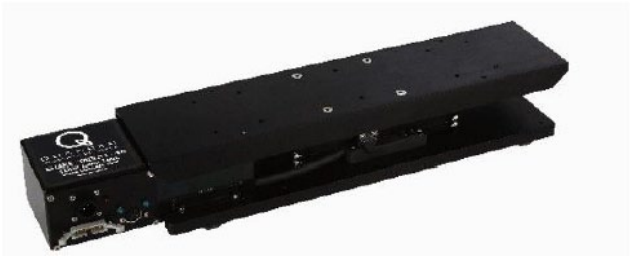


Figure 8 The Shaking Table

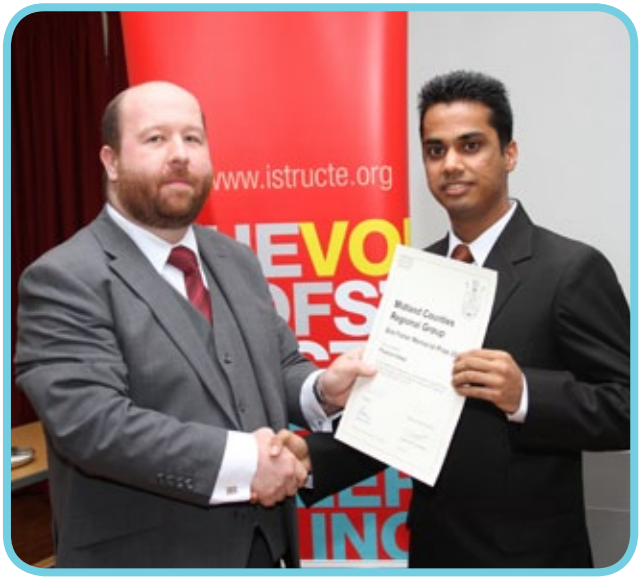
The School is in the process of introducing hands-on experiments in our UG and PG courses as well as setting up of some monitoring system that can be used with scale models mounted on the table which will make the subject even more interesting. Students are encouraged to put forward research proposals that are online with your plan of studies and to liaise with staff to setup an event within or outside campus to disseminate science amongst fellow students and or young scholars.

The School of Civil Engineering wishes to thank the *Circles of Influence Campaign* and more importantly its Alumni for providing the resources to fund this project.

If you would like to make a donation then please contact Kathryn Chedgzoy (**k.a.chedgzoy@bham.ac.uk**) and specify that you would like your contribution to go directly to the School.

Per Ardua Ad Alta

Prashant Sikka graduated top of his year with a MEng in Civil Engineering with Industrial Experience in 2007. This was no mean feat given the high standard of graduates in 2007. Despite many attempts by his then personal supervisor to persuade him to undertake a PhD, Prashant was keen to pursue a career in industry. Prashant joined Integrated Designs & Associated Ltd. and began training as a Civil & Structural Engineer. In 2013 Prashant decided to apply for membership of the Institution of Structural Engineers (IStructE) and obtain further professional accreditation having already gained accreditation with the Institution of Civil Engineers (ICE) in 2011. The core of the IStructE qualification process is the exam. This is no standard exam, but a real test of knowledge and endurance as it lasts for 7 hours with a pass rate of around 35%. Furthermore, both sections of the exam must be passed. In other words, there is simply nowhere to hide. Prashant achieved the highest marks of any candidate in the Midland Counties region and was placed within the top 3% of the 756 candidates worldwide who undertook the examination last year. As a result of this outstanding achievement, Prashant was awarded the Bob Fisher Memorial Prize presented by the IStructE Midland Counties Regional Group. When questioned about his achievement, Prof Sterling said: "*To be honest, I was not the least bit surprised. He was an excellent student and has gone on to become an excellent engineer. He embodies the University's motto rather nicely.*"

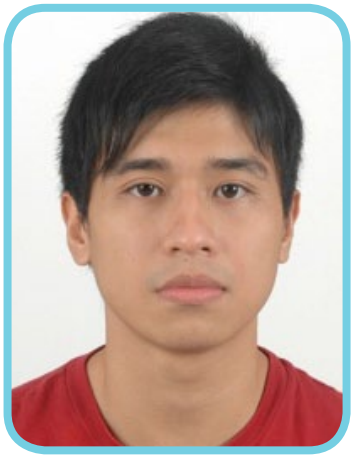


Craig McFadyen, Chairman of the IStructE Midland Counties Regional Group (left) presenting Prashant with his award (right).

Student articles

Never Back Down

Elton Yan writes….



Picture yourself walking down the campus street passing by a blissful poster of a successful student to which you would react with a fake smile, giving the thumbs up. I have always dreamed of becoming that person, sans the fake smile. Successfully graduating with a job at a top Civil Engineering firm has always been in my mind since I stepped on campus grounds.

Having no previous work experience in the Civil Engineering industry, I struggled in my sophomore year (pardon my US) to obtain a 1st year average to increase my chances in getting an industrial placement. I applied to many companies including the University's RESPECT Scholarship Scheme, which is a scheme where recipients would work and have their degree sponsored by the hosting company. Unfortunately, my applications were rejected despite all the effort. Was I not good enough, I thought?

Despite that, I continued to work hard in the following year. Prior to the January exams, I used a lot of my holiday/study break time to build my CV and apply to as many companies as I could. Big or small companies, renowned or obscure, I applied to ALL of them. I also devoted my time to reapplying to the RESPECT Scholarship Scheme and other forms of industrial sponsorship programmes. It was a mental struggle as I also had to prepare for my examinations within that period.

When the application deadlines were over, I waited patiently and prayed hard for an opportunity. The frustrations I had to go through; reading the replies from the 114 companies I applied to about how I did not make it through the application process.

Depression took over me. All that hard work and I could not satisfy even the smallest companies in the industry. "Just give up", said the voice in my head.

February came and a few more companies still had their application dates opened. Having predicted that I would most likely fail to secure a placement again, I decided to continue working hard to reach my goal. I improved my CV and spent more of my time filling in the applications. I was determined to make it in the industry.

But again, as the weeks passed by, more rejection emails filled my inbox. I was shattered and I felt ripped-off from sacrificing the majority of my time in completing those applications. At that point, I had already applied to a total of 139 companies.

Easter Holidays arrived and I was about to leave for a short holiday break. Unexpectedly, I received a call from HR at AECOM, a global consulting firm which is one of the leaders in the industry. It was the only company that had not responded to my application and they were calling me in for an interview. Upon returning from my holiday, I immediately prepared myself. I was feeling very anxious and thrilled at the same time.

The interview day arrived and it went very well. A couple of weeks later, I received a huge letter in the mail. To my biggest surprise, I was offered the summer placement! At that time, everything that I had done felt worth it and I knew that all the rejections I previously faced were successes which led me into waiting and working for this prestigious company, AECOM.

My story does not end there though. As I began my placement, I pushed myself to work extra hard and do the best I can to show the company that I was a good investment. Unexpectedly, halfway through my 3 month-placement, my Line Manager came up to me one day and offered me a sponsorship for the final year of my degree. I could not believe it as I thought I would never be able to become a recipient of such an award, based on the past application failures.

The months passed by and my summer placement was over. It was an amazing experience as I was given more responsibilities than I could expect and even made a lot of good friends within the company.

My final year began, and lectures ran as usual. It was the month of October, and everyone was talking about applying for a graduate job. My mind was with AECOM and I thought I would have to undergo the application process again. However, as November came about, I received an email about an offer for a position at the company!

I was overwhelmed and extremely grateful. I accepted it immediately and realised that I would be graduating with a job at the end of my degree.

I thank God for all the blessings that I have received and also everyone who supported me throughout my journey. I am now looking forward to graduating and returning to work for the company. I learned that failures are actually doors leading the path to success and that everything will happen accordingly if you work hard and leave the rest to God.

All in all, you should never back down from your dream even if it seems like all hope is lost. Opportunities may be just around the corner. I am an international student by the way, which means I have a lot more to prove being from abroad. I now walk the campus with the sincere smile of satisfaction.

The new face of Civsoc

Jo Macguire writes…

CivSoc is the University of Birmingham Civil Engineering Society, its aim is to provide a space where people can socialise with their peers in a relaxed environment and have fun. Although a much loved society CivSoc has gone through an upgrade this year, with the hard work of the new committee and a brand new logo we hope to change what has become a lost gem in the Civil Engineering School.

The society was founded on the principles of encouraging friendships between course mates and forging links between all years. Due to the varying workloads and the multicultural nature of the department we try to provide a multitude of activities suited to everyone. Although we still have the occasional wild night, the Hi-Vis bar crawl and Stamia club crawl, this year we have included a number of other activities such as laser quest, ice skating at trips to the Birmingham German market. CivSoc has also been a supporter of the Beale lectures organised by Dr Jenny Illingworth and has highlighted a number of essay competitions for those who prefer to get involved academically. The autumn term ended with the annual Christmas dinner and a visit from the CivSoc Santa.

As always improvement is an on-going process and in the future we hope to encourage links between the engineering faculty and students. In addition we want to become more involved in outreach activities and organise a number of education site visits tailored to the needs of each year.

The tale of a Female Engineering student

Jo Macguire writes…

I can't tell you how many times I've told people I'm an engineering student and they say: "there's not many women in that line of work" and then the inevitable question "so how many women are on your course?" It's a growing problem and a hot topic in STEM subjects.

At the recent Women's Engineering Society conference held at Aston University I was introduced to the concept of the leaky pipe and some quite distressing statistics. A survey conducted by Atkins found that only 30% of women choose to study STEM subjects at school, with only 18% then going on to study STEM subjects at university. In engineering 9% go on to work in the industry and from that only 3% go into higher level management positions.

So what is the problem? In my opinion engineering is fantastic; it covers a broad array of topics and provides a multitude of career opportunities. Not only that but it brings together problem solving and creativity using both sides of the brain. It also has one of the highest graduate employment/ salaries rate in the country. Most companies now offer flexi time which allows you to find the right work life balance especially if you need to work around family and partners.

So what needs to change? In my experience engineering wasn't really discussed in career talks, and in many cases guest speakers from engineering companies tended to be male. Also in a generation where attention spans are lower and instant gratification is high people don't want to study "hard" subjects like Maths if they can't see the benefit. Finally there is a lack of engineers in mainstream television programmes or movies; most female role models are teachers, doctors, lawyers but there are no engineers. A fantastic campaign at the moment is goldibloxs, toys specifically designed to encourage the new generation of female engineers, although some see it is as controversial it is succeeding in getting female engineers into the mainstream.

I believe that female engineers need to lead the way and encourage other girls and women to consider this career. Engineering needs more exposure and people need to start understanding what an engineer does. I was lucky to have the support and encouragement to follow this path but others might be deterred by what may seem a man's world. The future of engineering relies on collaboration between men and women who can both provide important skills and inputs. However this can only be achieved by encouraging more women to enter the fantastic world of engineering.

Outreach

Neil Nelson writes…

The School's mission of increasing awareness of Civil Engineering as a future career was boosted in March when our cable stayed bridge was completed.

The bridge breaks down into a kit that can be reassembled as required, either as the whole bridge, where it can be walked across, or as two halves, as a competition between two teams.

The School's Outreach Team, headed up by Dr Quinn, has been using the bridge to demonstrate moments, tension and compression at Open Days, Applicant Visit Days, Discovery Day, Community Day, and also as a team building exercise by teachers and staff.

In addition to university wide events, and also in conjunction with the ICE, the bridge makes regular trips out to schools, colleges and community events, all over the country.

In keeping with the structures theme that is widely recognised as a hallmark of civil engineering, the Outreach Team has also delivered workshops involving constructing suspension bridges from paper strips, as well as truss bridges using rolled paper tubes.

The large bridge kit has been in key feature in the School's Masterclasses, offered on a Wednesday afternoon for schools and colleges to join. These has have been hosted by Dr Quinn and Dr Metje, and are designed to teach a practical application of a component from the A-Level Mathematics syllabus.

Dr Joanne Leach has also delivered a workshop based upon the Liveable Cities project, and Dr Ghataora has been helping young minds understand shear stress using tissue paper and strawberry bonbons.

If you'd like to see the Civil Engineering Bridge or any of the other workshops delivered either on campus or further afield, please contact me on **n.nelson@bham.ac.uk** for more details.

The Beale lecture series

Jenny Illingsworth writes…

First term of Beale lectures proves highly popular
Beale there or Beale square??

As a response to students' wishes to hear more from the civil engineering and related industry, the School has organised a programme of 16 extra-curricular lectures, delivered after the end of the usual teaching day, on Tuesday evenings.

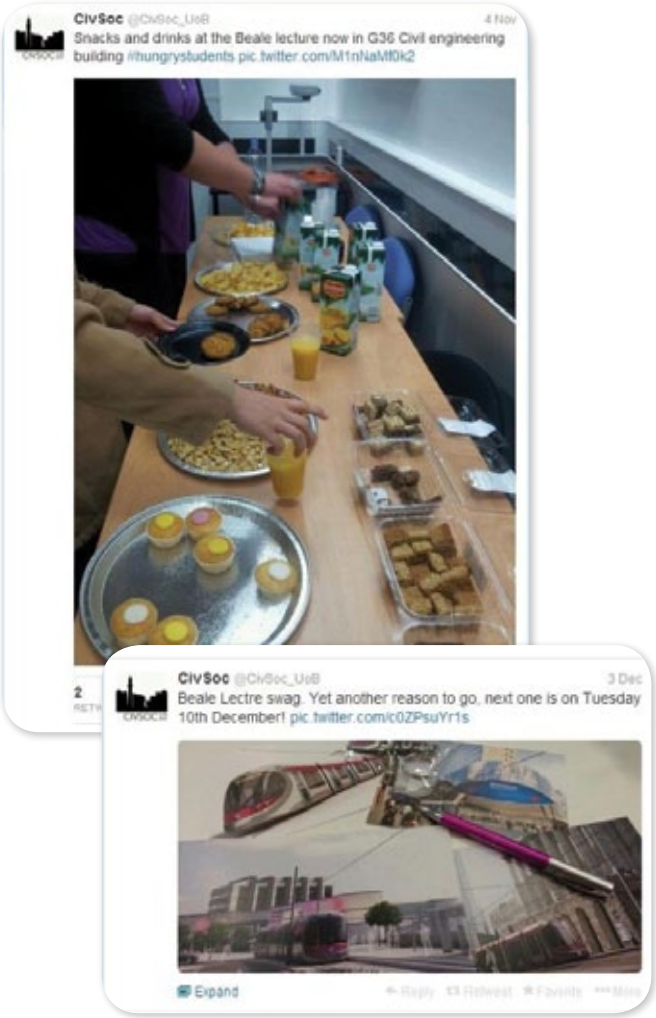
Jenny Illingsworth, Industrial Liaison Manager, was impressed at the response from the School's industrial contacts. Having originally planned 3 or 4 talks a term, the enthusiasm with which colleagues in business answered the invitation to speak has meant the programme mushroomed into a weekly event. The 30-50-strong turnout each week has been helped by the student society, CivSoc, arranging to meet regularly after the lecture for a drink, meal, or activity (and by sending tweets about the great snacks and giveaways some of the speakers have brought with them).

The Beale series for 2013/14 started off with Neil Kelsall of Arup speaking about the mulitidisciplinary nature of engineering, using a recent project to create a new rail link between Kings Cross and the East Coast Main Line as an example: fitting everything into existing tunnels was one of the biggest challenges, not to mention the spaghetti of electrical cabling and the plethora of industry-specific jargon!

The Autumn term's lectures moved to case studies on structural projects and the implication of the engineer's choices (George Oates of Expedition Engineering); Ground Engineering (Jim de Waele of Keller Ground Engineering); a consultant's life (Martyn Lester of Amey); introductions to both the Institution of Structural Engineering (Tasha Scott of WSP and colleagues from the Young Members' Panel) and the Institution of Civil Engineers (Damian McGettrick of WMP Plant Hire); an update on the local Midland Metro extension project (Peter Adams of Centro); and the term was finished off in style with a session on the campus developments and the new university library by a team consisting of Stephen Ashton, the university's Estates Project Manager, Warren Jukes, Director of Associated Architects who designed the building, and David Storer, Director of Arup on the structural analysis. Work on the library project is due to start early in 2014 so the talk was timed to perfection.

The spring term's series will be as eclectic and stimulating, with contributions from Arup, Atkins, IBM, C2HM Hill, Hyder Consulting, URS, Balfour Beatty and WSP. Topics will range from considerations of the financial, risk and commercial aspects of being an engineer, design projects, linking infrastructure to its operating systems, developments in construction materials, and construction case studies. Full details are on the Beale Lectures' web page, at **http://www.birmingham.ac.uk/schools/civil-engineering/news/events/beale-lecture-series.aspx** and students, staff and anyone else interested in the topic are welcome to attend. For eligible current students, PSA points are available and a Certificate of Attendance will be given to students who have been to 12 or more lectures.

To offer Beale talks or to be connected with Civil Engineering students for placements and graduate opportunities please contact Jenny Illingsworth, Industrial Liaison Manager, on 0121 414 4165 or email at **j.s.illingsworth@bham.ac.uk**.



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Past exam questions.

As per usual, answers on a postcard please….

UNIVERSITY OF BIRMIMNGHAM
Degree of B.Sc. (Honours and Ordinary)
School of Civil Engineering
Final Examination

CIVIL ENGINEERING CE 3.91 AND CE 3.90
HIGHWAY & TRAFFIC ENGINEERING
Friday 9 June 1972, 9.30 a.m. to 11.30 a.m.

Answer **three** *questions*

1. Define delay in the context of a road intersection. Discuss the difficulties of measuring or estimating the delay. Comment on the procedure you would adopt to make some measurement of delay at a road junction.
2. **Either**, (a) Describe the field surveys that are required to establish a data bank for transportation planning. Comment on the performance and accuracy of alternative home interview methods.

   Or, (b) Discuss the implications of land use planning on the generation of traffic.
3. Draw a computational flowchart of the Transportation Planning process. Write a short description of the various analysis stages.

Degree of B.Sc. with Honours
School of Civil Engineering
Final Examination
Civil Engineering CE 3.15

THERORY OF PLATES AND SHELLS
Saturday, 3 June 1972, 2 p.m. to 4 p.m.

1. Answer **three** of the following. It is important to explain principles, and whenever possible examples should be quoted.
   a. Explain the important steps in deriving the equations for the defection of laterally loaded circular plates. A full mathematical derivation is **not** required.
   b. How can twisting moments be estimated from Moire fringe photographs.
   c. Describe the potential energy method of determining the deflection of laterally loaded plates. The strain energy of a plat is given by the expression.

$$U = 0.5D \iint \left[\left(\frac{\partial^2 w}{\partial x^2} + \frac{\partial^2 w}{\partial y^2} \right)^2 - (2 - v) \left(\frac{\partial^2 w}{\partial x^2} \frac{\partial^2 w}{\partial y^2} - \left(\frac{\partial^2 w}{\partial x \partial y} \right)^2 \right) \right] dxdy$$

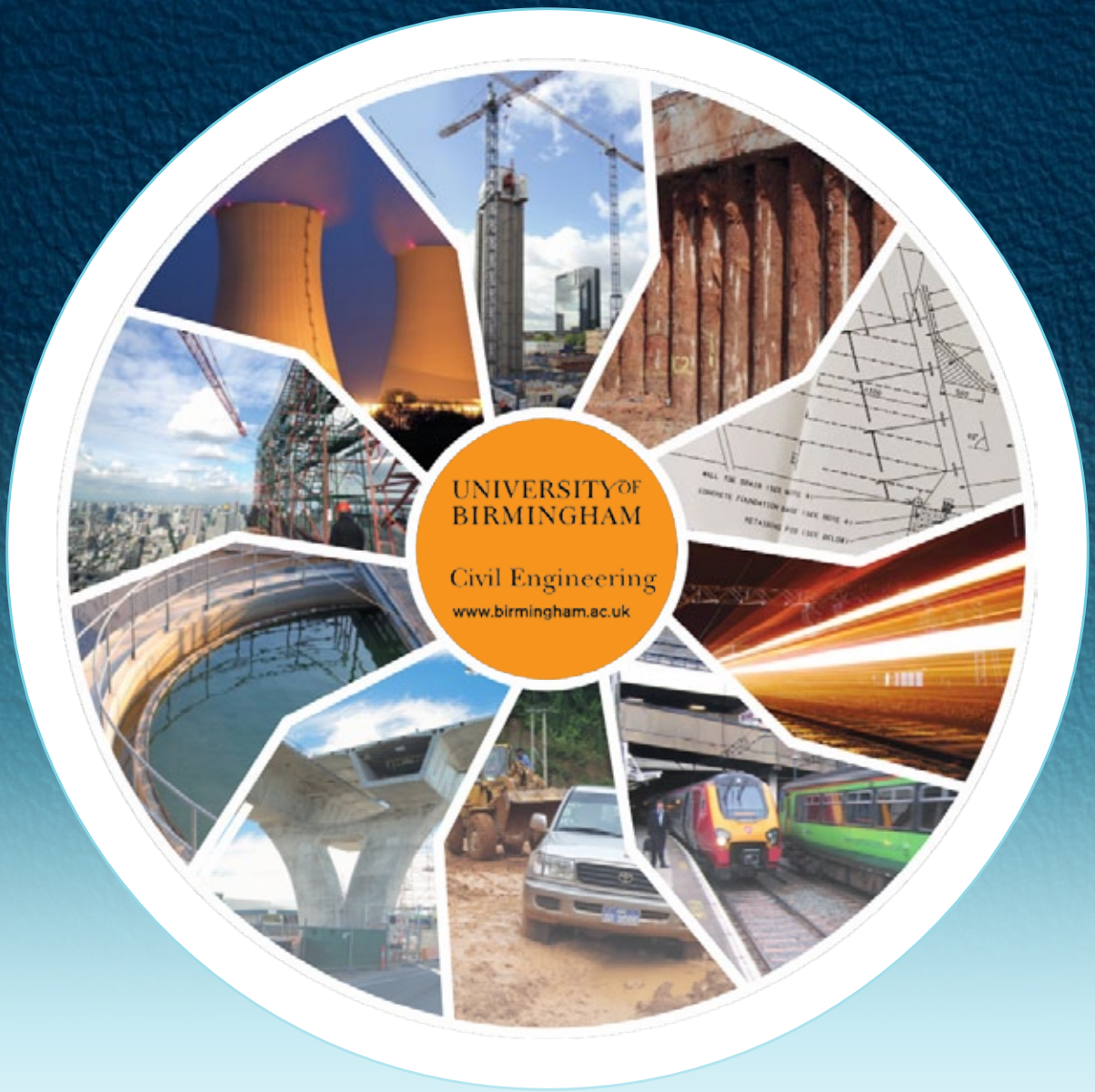
   d. The governing equations for membranes stresses in shells of revolution are as follows:

$$\frac{\partial}{\partial_{\emptyset}} (rN_{\emptyset}) + r_1 \frac{\partial N_{\emptyset\theta}}{\partial \theta} - r_1 N_{\theta} \cos \emptyset + p_{\emptyset} r r_1 = 0$$

$$\frac{\partial}{\partial_{\emptyset}} (rN_{\emptyset\theta}) + r_1 \frac{\partial N_{\emptyset}}{\partial \theta} - r_1 N_{\theta\emptyset} \cos \emptyset + p_{\theta} r r_1 = 0$$

$$\frac{N_{\emptyset}}{r_1} + \frac{N_{\emptyset}}{r_2} = p_r$$

Explain the meaning of each of the symbols. How can these equations be simplified for axially symmetrical loading?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Civil Engineering
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