

# Creativity and fun: core strengths

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2015 President of The Institution of Structural Engineers

## Synopsis

The structural engineering profession is fun and brilliantly creative. Look at the list of Institution Gold Medal winners over many years. They have won this highest honour because they are exceptionally creative. Yes, their mathematical skills are undoubtedly excellent too, but without creativity they would not have won such an award. There is an innate creativity-led attraction among children, in particular, in connecting things together, building up a tower, breaking it down, learning from their mistakes, and doing it all again. We are big kids.

The structural intuition we show at the age of 17, just before we embark on our university degrees, is phenomenal. We come armed with knowledge that an intact, doubly-curved eggshell is an inherently strong structure, tents seem very light and efficient when everything is nicely stretched taut, and a tape measure has extraordinary strength and stiffness over a long distance, as simple examples. But do we

retain such intuition throughout our formative education? Do we look to creative exploitation of geometry and materials in order to drive through sheer brilliance in structural engineering design? The temptation at university is often to switch off intuition and to size vertical and horizontal members instead, as though the latter were somehow more grown up.

In this inaugural address, I share my strong belief that we have some way to go yet in our formative educational activities before a hand-in-hand industry-academia link is formed which embeds creativity in our curricula as a key learning outcome. I believe that it is essential that the education of structural engineers centres on creativity, innate intuition and appropriate exploitation of materials right from Day 1 of a degree programme. The Institution plays a critical role in nurturing the abilities of our students and graduates in a collaborative and creative setting, and my address sets out how we might build still further on this.



I can recall with great pride and fondness the moment that Graham Owens asked me whether I would accept the Nominations Committee's suggestion that I put my hat in the ring to be a Vice-President of the Institution. My gratitude for the trust placed in me, my sense of responsibility and tremendous excitement have all simply increased over the years on the path to being President of this wonderful Institution. I shall do my very best to live up to the high expectations of this post.

Our Immediate Past President, Nick Russell, led our Institution with tremendous vision and humility during 2014. Our recent presidents have aligned their missions in areas of member benefits, education and a global outlook, and having worked with this wonderful succession of presidents, I intend too to be guided by these themes. I would like to thank them sincerely for the support they have provided me in my path over the years. Those thanks need also to be extended to all Institution staff and member volunteers who continue to lead me – rather ably – to the source of the light in the tunnel.

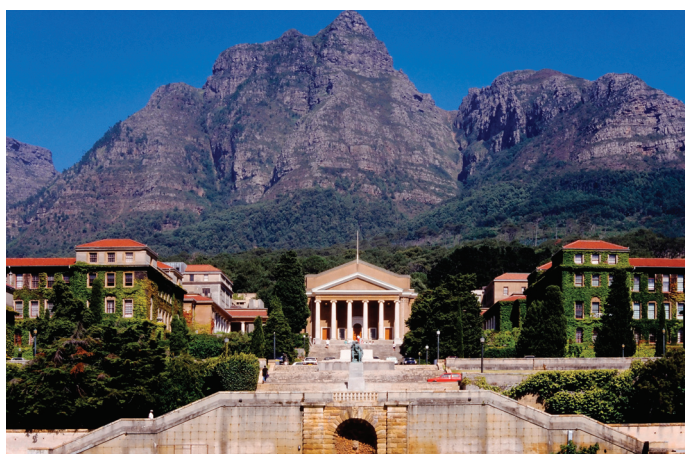
## Blue skies

I grew up in Cape Town in a suburb called Constantia (Figure 1), where the first vineyards in South Africa were planted in the 17th century. My love of wine has lasted. I attended Western Province Preparatory School (known fondly as 'wet pups'), followed by Diocesan College (known fondly as 'Bishops' or not so fondly as 'dead cats'; Figure 2). To my eternal shame, I couldn't be bothered to work hard at school (cricket always held more attraction for me) until I turned 16, which is when the switch went on. From that point, I grew up, concentrated on school work, and made my way into the University of Cape Town (UCT) (Figure 3) as a fresher. I chose to study Chemical Engineering. Within a few weeks of starting, I had changed to Civil Engineering. Whew!

Thankfully, I had an extraordinarily understanding bursary sponsor: Sasol, a vast petrochemical company. In good faith, they had agreed to give me a very generous

Figure 1  
Constantia





↑ Figure 2  
'Bishops'

← Figure 3  
University of  
Cape Town

bursary covering all fees, maintenance, travel and the promise of summer placements throughout my Chemical Engineering degree. They allowed me to swap to Civil Engineering, despite their petrochemical nature.

I had some outstanding university lecturers who inspired me throughout. I was offered a funded MSc, leading to a funded PhD, at UCT. In many ways, I had had an idyllic upbringing in Cape Town, and progressing at UCT might now seem to others to have been an obvious thing to have done. But this was the late 1980s, P. W. Botha was President of South Africa, and it was the era of apartheid. It seemed clear to me that a civil war was around the corner, and the compulsion to leave South Africa was strong. I was offered a scholarship to study for a PhD at the University of Cambridge, and this was my chance of escape.

### Blue skies thinking

My PhD years in Cambridge were fabulous. My supervisor, Chris Burgoyne, could

"Some of these friends helped T. K. Chan and me design and build a ferro-cement punt"

always be relied on to take our technical discussions on prestressed concrete towards rugby, but what I learned most from Chris and others, including Chris Morley, was a way of thinking, which represents priceless education. My PhD centred on how we should design anchorage zones for prestressed concrete structures. It led me into the world of shear plasticity for concrete structures, a tremendous tool when adequate ductility is possible. My many friends from that era are now directors, partners, associates, heads,

professors and deans at some of the leading practices and universities in the UK and the world. Some of these friends helped T. K. Chan and me design and build a ferro-cement punt (Figure 4). The punt floated, but was stolen shortly after its maiden voyage. Many years later, a dredging operation led to its rediscovery. Sadly, it had been scuppered and sunk. The ferro-cement's punching shear resistance had been inadequate, apparently.

On completing my PhD in 1992, I returned very happily to an evolving and healing South Africa in order to work for Sasol, who had now partially sponsored me over a period of seven years. South Africa's future was much brighter than it had been three years earlier. I lived and worked in a town called Secunda. Many say it is miles from nowhere. I say it is closer than that. It is located two hours' drive east of Johannesburg, on the way to the Kruger National Park, and my Afrikaans certainly improved during my time there. Sasol has a vast plant which dominates Secunda (Figure 5). It turns coal into oil and other by-products, and my largest role while I was there was to be Resident Engineer for a year on the erection of an acrylonitrile plant. I loved the job, I learned a tremendous amount from great colleagues, but I couldn't live in such an isolated town any longer, despite driving through a game reserve to get to work each morning; what's more, I had been hooked by research. My break came when Cam Middleton rang me from Cambridge to ask whether I wanted to return to work with him as a postdoctoral researcher on a funded project. I leapt at the chance, and waved goodbye to South Africa again, but this time for very different reasons.

My postdoc research involved the shear assessment of existing concrete bridges on behalf of the Highways Agency, which was funding this work alongside the Engineering and Physical Sciences Research Council. Cam had developed a powerful flexural analysis package for bridge assessment, but now that bridges were passing flexural assessments, they were starting to fail shear assessments, which were not yet based on 3D collapse principles. Between us, Cam, Chris Morley and I developed a plasticity-based collapse assessment technique for assessing the shear resistance of concrete bridges. This project came to a natural conclusion in 1997, and I needed a (proper) job!

### Bath time

I applied for a lectureship at the University of Bath in the Department of Architecture



and Civil Engineering. I had tutored architecture students while in Cambridge, and loved the idea of being in a joint department containing architects and civil engineers, particularly knowing something of the Ted Happold history of Bath, where he was Professor of Building Engineering. I arrived 10 minutes late for the interview because no-one had told me that the walk from Bath Spa Station to the university, which looked easy on the map, involved walking up a near-vertical hill. Despite this, both Pete Walker (who had made the identical error) and I were appointed to academic posts on the same day by Mike Barnes, who was Head of Civil Engineering.

Mike Barnes is, quite simply, the greatest academic I have had the pleasure of calling a colleague. His research credentials are outstanding. His teaching credentials are even better. Watching him in the design studio, while he sketched connection details for the benefit of students or got students

to play with structural concepts via intuition rather than through numbers, I learned pretty well everything I now use today in the education of students. But Mike's greatest strength of all is leadership. He built a strong team around him, trusted them to succeed, let them get on with it and motivated them continually. Subsequently, I have tried to emulate this throughout my career. As a Lewis Kent Awardee himself, he encouraged

me to become a Chartered Member of the Institution, which I did, and then immediately brought me onto the Academic Qualifications Panel (of which he was Chair), the Western Counties Regional Group Committee and the panel of Professional Review Interviewers. From there, I became Chair of the Academic Qualifications Panel, and joined the Membership Committee. In 2006, I was invited to represent the Institution on the Joint Board of Moderators, which I did for the maximum six years. In 2007, I received two letters from then Chief Executive, Keith Eaton. One invited me to stand for election to Council. The second, later in the year, invited me to stand for election to the Board of Trustees. This simple gesture of being asked to stand for election filled me with confidence and pride. How could I possibly not stand? Election to Vice-President followed in 2010. I also became Chair of the Western Counties Regional Group in 2011. Without Mike's initial encouragement, mentoring and guidance, I would not have set off down this path in the Institution.

My research continued into the realistic assessment of structural capacity, but also began to diversify. I became more and more interested in the use of fibre-reinforced polymer (FRP) materials to reinforce and prestress new concrete structures, and also in their use to strengthen existing concrete structures (Figures 6 and 7). I was very fortunate to have outstanding colleagues in Antony Darby and Steve Denton, without whom this research would simply not have developed as successfully as it did. I also had a succession of strong PhD students, who were able to develop tools and techniques for practitioners to rely on in using these new materials.

In 2002 I was awarded a Fulbright Distinguished Scholar Award to spend a year in the USA, working on FRP-strengthening of concrete structures with one of the world's leading experts, Tony Nanni. This was a very special year, and it opened my eyes to the crucial importance of collaboratory and impactful research. On my return, a longstanding academic colleague of mine at Bath (Aki Salo, a sports scientist) organised a drinks party in one of the campus bars, which is where I met Jackie, who was running the administration of the Department of Sports Science at the time. It was 17 July 2003. Some dates don't fade. We've been together ever since, with our son James joining us in 2005.

Research into the use of FRP to strengthen concrete structures remains

Figure 6  
Column strengthening

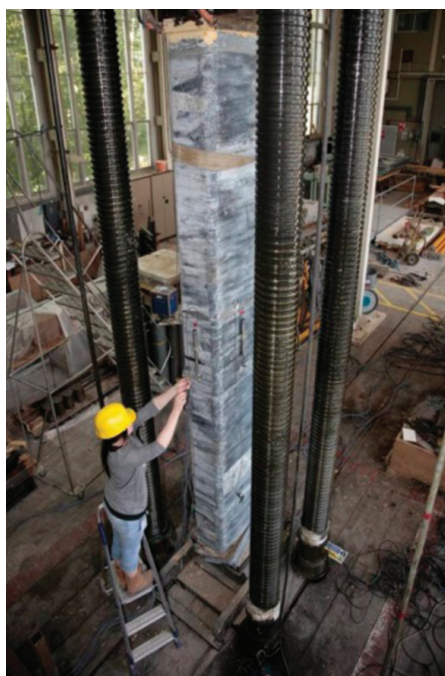


Figure 4  
Concrete punt (Tim Ibell at front)



Figure 5  
Sasol plant in Secunda



a key theme for me, as there is much yet to understand and invent. My team and I have co-authored design guides, an expert system, journal articles and trade-magazine papers on FRP-strengthening of concrete structures. In particular, we have tested some very large FRP-strengthened structures, because there is a significant size effect which must be understood. We have invented the deep embedment technique for strengthening concrete structures in shear, and we have developed realistic structural-mechanics-based analytical techniques for the basis of rational design.

But over the past few years, my research has branched out again towards the use of fabric to form architecturally-interesting and structurally-optimised concrete structures (Figure 8). This research is conducted alongside Antony Darby, John Orr and Mark Evernden at Bath, Mark West at Manitoba, Remo Pedreschi at Edinburgh and Pete Gosling at Newcastle. In a nutshell, we are asking the question: Why pour beautiful, mouldable, high-carbon-footprint concrete into a boring rectangular mould every time? By relying on fabric to form the concrete, we can place concrete where we need it and produce interesting concrete architecture. Given that a bending-moment diagram is merely a line of tension, the fact that the fabric stretches means that it is creating the appropriate shape for the resistance to bending. Along the way, we have had to solve problems relating to reinforcement anchorage, shear reinforcing strategies, shear capacity prediction issues for tapering beams, construction repeatability, form finding, optimisation, serviceability and fabric choice.

My colleague Pete Walker has led the BRE Centre for Innovative Construction Materials (BRECICM) at Bath since its inception in 2006. BRECICM epitomises to me the scope for innovation in structural engineering which the successful exploitation of materials offers us. Members of BRECICM work on materials ranging from green oak to glass, from rammed earth to self-healing concrete, and from FRP to lime. Every great technological profession relies on the continual development and exploitation of outstanding materials to provide better solutions. Structural engineering is just such a great technological profession, and I believe that an ever-growing understanding of a wide range of emerging materials should be second nature to all of us. As simple examples, what opportunities

Figure 7  
Beam strengthening



might graphene hold for us in structural engineering, and what materials could and should we be considering for 3D printing of large structures?

There are all sorts of questions and opportunities that lie ahead in structural engineering research and practice, and The Institution of Structural Engineers continues to have a leading role to play in encouraging our profession to tackle the big issues collaboratively and creatively.

### Going places: Bastwick Street and beyond

In May 2014 we said goodbye to Upper Belgrave Street, and in December 2014 we said hello to Bastwick Street. This is one of the most significant projects which the Institution has undertaken in recent years. Our future is more secure than ever now that we possess our very own International HQ building in London. If you are yet to see your new building and you happen to be in London, please pop in and say hello.

But this is far from the only major project

being undertaken at HQ. As a few examples, under leadership from Chief Executive, Martin Powell, and his Directors, the Institution has:

- restructured the Engineering Practice Committee in order to provide a core focus to the Institution's guidance on technical issues
- started to introduce international comparability routes for highly-qualified structural engineers elsewhere in the world who wish to be considered for membership of the Institution
- launched the research journal *Structures* under the leadership of Lee Baldwin and Leroy Gardner (Editor-in-Chief)
- started planning for an Institution Conference in Singapore in 2015. Please join us!

### STEM should branch out

From time to time, you will probably have glanced at the Institution's boards containing the celebrated names of the winners of our Gold Medal. It has long struck me that it is not the mathematics- or physics-based skills of these extraordinary structural engineers which place them apart from most others in the Institution. It is their creativity. It is true that their mechanics-based skills are outstanding too, but without the creative aspects of their make-up they would not have been Gold Medallists.

Why, then, if the soul of our profession is creativity, do we not put this attribute at the centre of our education of school children (to learn more about structural engineering as a profession), students (to become graduate members with us) and the general public? It is my strong belief that all of us have a responsibility to enthuse

"Why pour beautiful, mouldable, high-carbon-footprint concrete into a boring rectangular mould every time?"





Figure 8  
Fabric-cast concrete 'bending moment' beam



SHUTTERSTOCK

Figure 9  
How does an egg work?

school children, students and others about structural engineering by pointing to the fun bits of what we do. There are many messages from all sorts of quarters which suggest that encouraging school children to stick with STEM subjects (Science, Technology, Engineering and Mathematics) at school by demonstrating the relevance of STEM to engineering is a crucial aspect in ensuring that we have a suitable pool of talent ready for an engineering education at university when they leave school. This is an important message.

But I feel that there is just the possibility that some of us who engage with school children are missing a trick. We should all be placing at the very forefront of our message to school children the fact that structural engineering is a tremendously creative, exciting and fun career; before we mention anything to do with numbers, we should be fuelling the concept that creative problem-solving is the real core of structural engineering. STEM provides a modelling framework for us rather than a driving force, and therefore our message should reflect this. By showing school children the fun aspects in an inspirational manner, they will discover for themselves what it takes to be a structural engineer, and this will lead them naturally down the STEM path through self-realisation, rather than through third-party

information. A colleague of mine who directs admissions into civil engineering degree programmes at Bath, Paul McCombie, has shown that there is a direct correlation between success at school and success in civil engineering at university when the student comes with high achievement in mathematics and art. He has also shown that high achievement at school in further mathematics and physics does not lead to such a clear correlation. A creative mind seems to be a prerequisite to becoming a successful structural engineer. This message needs to echo everywhere.

Another colleague, Paul Shepherd, specialises in public engagement. Paul studied a mathematics degree and an engineering PhD, then spent nearly 10 years at BuroHappold as a special structures designer, and has been at the University of Bath since 2007, developing an award-winning approach to public engagement. My favourite example of Paul's many and diverse demonstrations to 20 000 school children (and counting) is when he stacks up a Jenga-like tower on top of a mini-shaking table which is connected to a computer,

taking a feed from a microphone. The tower's natural frequency is about 2Hz. When the children clap in unison at about 1Hz or 4Hz, the tower wobbles a bit under the induced movement of the shaking table, but it does not collapse. When the children clap at about 2Hz, the tower collapses, leading to a wow factor, together with conversations about how an understanding of the manner in which natural forces interact with structures is a necessity for great design.

All through my undergraduate career, I wanted to know how an egg worked, and I wanted to know why we weren't being taught to take advantage of such a brilliant structure (Figures 9 and 10). I worry that the very necessary creativity, fun and intuition involved in world-leading structural engineering is sometimes sucked out of engineering degree programmes such that a graduate considers the entire language of structural engineering to be columns, beams and slabs. It remains a central theme to me that intuition, exploitation of materials and creativity lie at the heart of great structural engineering. If you have not



Figure 10  
Exploitation of geometry



M. EBBEN VIA WIKIMEDIA

yet seen the TED talk by Sir Ken Robinson on the importance of creativity in education, take a look at [www.ted.com/talks/ken\\_robinson\\_says\\_schools\\_kill\\_creativity](http://www.ted.com/talks/ken_robinson_says_schools_kill_creativity). Through wonderful wit it makes a convincing case that we must allow students to feel able and willing to make mistakes during their formative years. Without the freedom to experiment in a supportive atmosphere, their creativity is stifled. Given that we really have no idea what our structural engineering students of today will need to have mastered for their day-to-day activities in 40 years' time, our education system needs to capture the essence of learning how to learn in a motivational setting.

One of the key reasons I wished to become an academic was to teach. My philosophy is simple: inspire the students, and they will learn all they need to know through their own endeavours. I feel it is essential that the raw structural intuition which exists in a 17-year-old should never be crushed by a codified approach to 'designing' vertical columns and horizontal flooring systems by the time the same person reaches the final year of a civil

engineering degree.

A way to ensure that intuition is retained is to give first-year students open-ended design projects to consider, and to keep it all fun. Sketching and model-making must be high on the agenda, as must precedent study of past structural successes, not merely the failures. Conceiving of how something will be built is great fun, and probably the reason our students chose this profession. Therefore, construction (not to be confused with construction management) needs to be a key element of inspirational design briefs. As engineering is all about problem-solving, and intuition plays an enormous part in this, students' intuition is fuelled continually while they realise that they need to know more technical things in order to solve even more convincingly the design problems which they have been given.

Conversely, if projects build up slowly from the first year according to what students already know, they will be hamstrung by this newly-acquired knowledge and will tailor their solutions to the known. This isn't good enough. Students must be given room to explore concepts well beyond their comfort zone, to dream a little, experiment with ideas, and to make mistakes without fear of this holding them back in any way. Stretching design projects, embedded throughout a degree programme, allow all of the above to occur in an inspiring atmosphere. Education is about drawing out, not shovelling in, which is why the educational side of the profession makes for such a fascinating career. Students need to know what it is that they do not know. This is education. If you haven't tried teaching, then do!

### Graduate retention Structural Behaviour Examination

For many years, I was fortunate to be a member (and briefly chair) of the Institution's Membership Committee. The statistic which always grabbed me round the throat was the small percentage conversion annually from Student Membership to Graduate Membership for those students who had finished their degrees. For many years, the Institution has known that we need to do more to ensure that our Student Members feel it a worthwhile endeavour for them to move to Graduate Membership. Such Graduate Membership at the early stages of one's career comes with large discounts, but discounts and kudos alone are not sufficient to ensure that graduates see us as the natural home for their life-long professional affiliation.

So, we have acted. There is an exciting initiative within the Institution which promises to help significantly in our attraction of young structural engineers to move to Graduate Membership because it offers tangible benefits. We will shortly launch the Structural Behaviour Examination (SBE), which aims to provide an international benchmark for the understanding of structural behaviour. There are two aspects to this venture.

The first aspect is the examination itself, which when passed under invigilated conditions will lead to the award of a certificate. When coupled with an Incorporated Engineer qualification, passing of the SBE will allow IEng members to progress to CEng assessment immediately. This package would allow IEng academic qualification holders (Bachelor's degree in the UK or Sydney Accord degree outside of the UK) to move to Chartered status via Incorporated status in a relatively fast-track process, without the need to submit a Technical Report.

The second aspect of the SBE is formative development of members' structural understanding. Any member of the Institution will be able to download a randomly-generated online test of structural behaviour. By completing this multiple-choice test at one's convenience and as often as one likes (the test will always be different), the understanding of structural behaviour worldwide will improve among all members of the Institution. The formative feedback from taking such a test consists of any wrong answers being flagged, with reasons given for why they are incorrect. There are presently a little over 200 questions in the database from which these randomly-generated tests are selected, and numerical values are easily altered from test to test such that additional variety is embedded.

"A creative mind seems to be a prerequisite to becoming a successful structural engineer"



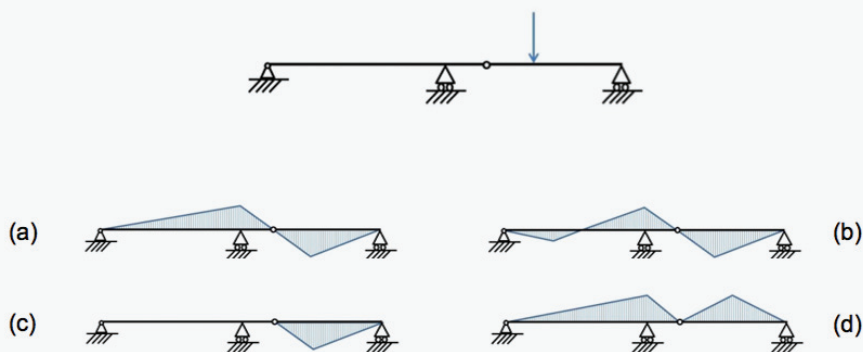


Once the test is launched online, I urge you to take it. Please play as long as you want, and as often as you like. This is why the test will be so successful. It allows us to make mistakes in a non-threatening, anonymous atmosphere, and to learn deeply from such mistakes and from the reasons given for the mistakes. At my university, we introduced such a system for our students in 2012, and through a related research project on how students learn structural engineering, we discovered that students' understanding of structural behaviour soared from an initial score of around 40% to about 80% after a few attempts using a similar online tool.

The test covers both qualitative (no numbers) and quantitative analysis of trusses, beams and portals. Deflected shapes, effects of relative stiffness and approximation of points of contraflexure are the required aspects when indeterminate structures are considered. We have also included plasticity, hanging cables, arches and dynamics in the test. Personally, I am very keen that students understand cables and arches as deeply as they understand portals, because profound insight into structural behaviour and appropriate exploitation of materials comes through creative consideration of structural geometry.

I sincerely hope and expect that universities will embrace the online test, and use it as part of their educational package. By doing this, Student Members will be exposed to the Institution as a value-adding professional body which raises standards and assists with the education of structural engineers worldwide. It is hoped that student members will then be more motivated than ever before to switch to Graduate Membership, and to benefit from the support which the Institution has in place for all its members.

I also fully expect employers to use the online test as part of recruitment or refresher courses. For many years, one of our fellow Chartered Structural Engineers, David Brohn, has tested graduate ability in an understanding of structural behaviour. His well-established test has shown us all that the basic understanding of structural behaviour among students and graduates is not as strong as it should be, and so the introduction of the SBE is a wonderful Institution-led initiative for the world of structural engineering. Two examples from the test are shown in Figure 11. In each case, you are asked to choose the correct bending moment diagram (qualitatively for the beam and approximately quantitatively for the portal).



### Engaging with students

But what else might the Institution be doing to engage better still with our Student Members so that it becomes a natural path to join us immediately on graduation as Graduate Members? The Institution has worked extremely hard over the past few years to ensure that more and more universities have a dedicated Student Liaison Officer (SLO) in post to act as the voice of the Institution within universities. This drive has been terrific, and the number of SLOs has soared. They are vital ambassadors for the Institution, with the responsibility on their shoulders to not only encourage Student Membership but also to encourage Graduate Membership when the students near graduation. But is there additional support which we might provide to our SLOs in order to successfully undertake these responsibilities?

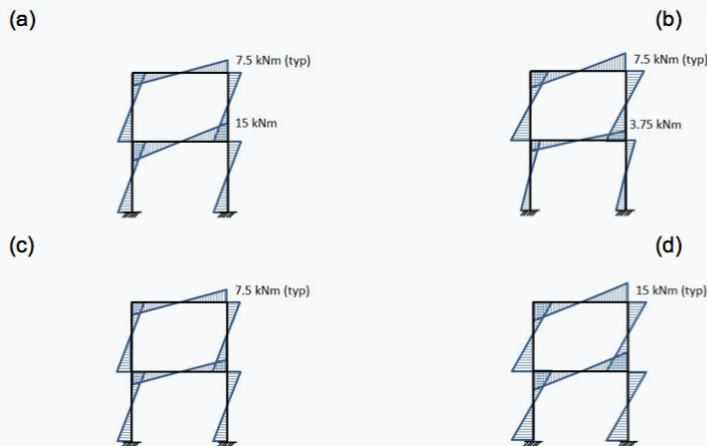
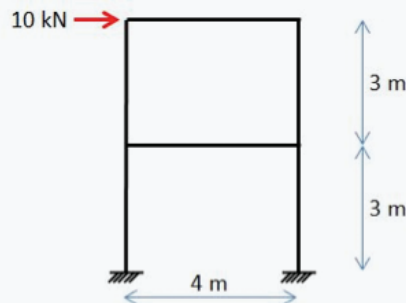
During my presidential year, I wish to talk to all members, but particularly to our younger members and our SLOs, about additional initiatives which the Institution should be taking to retain talent right through all stages of membership. We are doing much already, but what more might be done? Personally, I have a few ideas. These include the Institution:

- hosting an inspiring and image-intensive social media platform for students and graduates, which includes career-related enhancement opportunities
- ensuring that final-year students at universities know about the benefits of Graduate Membership, and are able to start the easy process of sign-up to Graduate

Membership while still in final year

- engaging with our SLOs to understand what support they require from HQ in order to ensure that appropriate activities are offered to our Student Members
- helping Regional Groups to set up, develop and successfully run young member panels in all the regions such that a student- and graduate-led programme is attractive to Student and Graduate Members
- empowering Student Members to take responsibility for the future of the profession by assisting them to give a structural-engineering-related presentation at their old school where the mindset of previous schoolmates will be well understood (preferably in partnership with STEMNET or other wider engineering community initiatives)
- continuing to support financially and technically the development of online learning resources under the Workshed banner ([www.expeditionworkshed.org](http://www.expeditionworkshed.org))
- encouraging academics to engage with Graduate Members in their place of work such that technical deepening occurs on the job in a seamless transition from university

But run-away aspirations need to be kept in check as resources are always limited, and indeed you will have a whole host of other ideas. During 2015, I want to talk to you about your ideas and those above, so that in the long run the Institution is able to build on some of these to enhance our present activities still further and to ensure the attraction of creative structural engineers



**Figure 11**  
Examples from Structural Behaviour Examination ((a) is correct in each case)

to go on to become professionally-qualified members of the Institution. We need to enhance still further our offering of tangible benefits to our younger members, and we need to represent all that is great about our profession.

### Developing the next generation

As structural engineers, we represent a highly creative profession. We should use this fact in nurturing, developing and educating the next generation of structural engineers. In order to retain more of our Student Members through to Graduate Membership, the Institution has taken great strides recently to ensure that our offering is relevant to Graduate Members. The outcome is the SBE, which fulfils such an objective in an inspirational manner.

Through this initiative, the Institution will be recognised worldwide as raising the standards of all structural engineers. This is quite some legacy, and a very proud time to be associated with the Institution.

Armed with this pride, I would very much like to see us do even more to ensure that we attract the very best young structural engineering talent as the natural professional home for career development. As an example, might we look to treat our Associate and Chartered Membership Examination preparation courses, which are offered all over the world, as strong developmental courses in their own right, covering conceptual design? For some time now, we have been considering how our members might benefit from Continuing Professional Development qualifications

"I would like to lay down a challenge to all members to undertake one action"



offered by the Institution, and ideas are gathering for how such member benefits might be moulded in the future.

In the spirit of immersive engagement in order to try to broaden our appeal to the next generation of structural engineering leaders, I would like to lay down a challenge to all members to undertake one action. I suggest that:

- Student Members each go back to their old school (preferably with STEMNET) to engage in **creative ways** with school children whose mindset they understand
- Graduate Members and professionally-qualified members offer to help local universities in tutoring of open-ended and exciting projects where intuition and concepts are rewarded to a greater extent than calculations and member sizing. Such activity would count greatly towards Initial Professional Development objectives for Graduate Members, and towards Continuing Professional Development objectives for others, while stimulating our Student Members to join us as Graduate Members
- academics go into industry to help deepen technical skills among graduates and to disseminate their recent research in ways which are mutually beneficial. Our Institution is host to practitioners and academics, and encouragement of these linkages is crucial to our future, representing a wonderful opportunity for all members
- academics ensure that 'creativity' is a specific learning outcome in the undergraduate education of our structural engineers

The Institution represents one of the easiest-to-sell professions on the planet. What could be more exciting than a long bridge, a tall building, a crane or even a big hole? Let's shout that our profession is creative, fun and inspirational. The rewards for recognising and celebrating our own key strengths await us.