

# Profile



Award-winning structural engineer **Chris Wise** has always challenged convention and has no plans to stop. In his sights currently are multiple targets, including the whole structural engineering profession, its businesses and his own future. By Jackie Whitelaw.

## Director of Expedition Engineering,

Chris Wise, has masterminded two Supreme Award winning projects in The Institution of Structural Engineers' Structural Awards – Infinity Bridge (Stockton-on-Tees) and the London Olympic Velodrome. In his earlier career, he was Arup's youngest director, when he worked extensively with Lords Norman Foster and Richard Rogers. And he led the original design of the Millennium Bridge in London, which, because of its wobble on opening, is one of the capital's best-loved structures. In all, he is recognised as one of the most inventive engineers of his generation.

Now nearly 60, does he plan to coast along for five years and enjoy the plaudits? No, that's not the way ahead for him. Wise has always disrupted accepted thinking and now he is using that enthusiasm for change to focus on one of the biggest challenges of them all: the future of the structural engineer in a world being turned upside down by digital technology.

It is a problem he is looking at for the profession, the business of structural engineering, his practice and himself. The ride might be uncomfortable, but the forthcoming upheaval will be necessary and is going to take bags of nerve, he suggests. Or verve. Or both.

## Embracing the revolution

First the profession and the impact on it of the digital fourth industrial revolution. "You can describe the future of structural engineering as something that, like the dinosaurs, is about to be struck by an asteroid. It's disaster time and the profession is going to have to change.

"The big beasts may have to turn into tiny mice and run about on the forest floor and evolve into something else," Wise says.

"Now there is so much that can be automated, structural engineering may not even need to be done by structural engineers at all. With much of the new software, a seven-year-old could do it."

Next, the business of engineering. Many current industry structures and institutions, he says, are "frankly past their sell-by dates" and are not set up to cope in a future when



companies are going to be selling ingenuity and results rather than hours worked.

"There are great people in the big companies, but their business environment is stopping them using their full potential. A lot are acting as human calculators and that's not engineering. If that is what people are doing, they will soon be replaced by computers, and that's a good thing. Because then they will be free to do what humans do best: complex problem solving; dealing with new phenomena; and being human."

And conventional business models that rely on charging for engineers by time are illogical.

"It is idiotic to charge by the hour. We are trying to abolish timesheets at Expedition Engineering," Wise says. "Measuring by time is not reflective of what we are capable of and it sometimes encourages people to take even more time to do things. It's ridiculous. Instead I want people to pay us by ideas, by service and by output. Serious numbers of pounds for great results, zero if not. But I recognise you need a client you know and trust to do that, so that real value is rewarded fairly. Maybe abolishing timesheets is not for the naive in the first instance!"

Ingenuity, great thinking and a willingness to challenge the norm were what Expedition Engineering had to sell when Wise set it up with

first partners Seán Walsh and Chris Smith in 1999. "That's what we used to differentiate us, doing funky, mind-blowing things. We used to call it 'Serious Fun'. And we got lots of interest from good architects who could say that they needed to collaborate with us to achieve something challenging and influential.

"Now what we do has become confused with something many others offer, or appear to offer. Usually industry is insisting we win commissions through project managers, some of whom I don't think are able to judge the difference between the really excellent and the superficially excellent."

Excellence he defines as being "about taking out as much as you can, leaving just what you need. You get something beautiful. You don't have to be showy, it's just naturally beautiful inside and out."

As for "superficially excellent" – "that's engineering style over substance, waiting to be asked a question, then complying with every code of practice for extra bounce and sticking 10–20% on the structure for an extra safe result. That takes a lot less in design thinking and it's not intrinsically elegant. It might be commercially expedient for consultants, but we should be ashamed of ourselves: this sort of overdesign adds billions to the structures engineers design every year."

## Unlocking innovation

Along with the big picture for business, Wise is also contemplating the future for the Expedition Engineering practice. Eight years ago, the business ownership was changed to a trust model. The Expedition partners gave the business away to the Useful Simple Trust to safeguard it for the employees, which now number 75. As part of that process, the business had to define its purpose, which the trustees are obliged to operate to, for the benefit of the staff.

"We defined our purpose as to blaze a trail in the ethical, integrated and intelligent provision of the human environment," Wise says. He has chaired the Trust since it began.

"Trailblazing has been difficult," he admits. "For every rocket that has gone up, a few

have come down. There is no guarantee of success, but it has empowered us all to be increasingly more forward thinking, more experimental, less conservative.”

However, it is hard to win work on that basis when forced to compete through conventional procurement models that are not so keen on innovation, or trailblazing, because they sound risky.

“Eight years into the Trust’s mission and

what I am thinking about now is how can we be trailblazing when the industry is a huge commercial juggernaut. The commercial and behavioural inertia is massive.

“Everyone says they want innovation, but the design management process especially is set up to stop it,” Wise continues. “Design managers don’t understand that really good design is not linear but iterative and convergent. They can’t really do it, yet they are telling designers how to

do it.”

Like all inventive thinkers when faced with a brick wall blocking progress, Wise plans to jink round it. “I am being forced to think much more radically and go back to first principles,” he says.

“My emerging thought is we need a more experimental practice vehicle designed to recognise that a lot of people are doing conventional overdesign and that someone needs to step outside of that. No one

## Wise on Wise

The prospect of a flamenco guitar-learning sabbatical in Spain was perhaps the catalyst that led to Chris Wise leaving Arup in 1999. He’d been with the business since graduating from Southampton University at the end of the 1970s and had a meteoric rise to become a director at the age of 35, 12 years later.

“The flamenco plan was a sort of placeholder for something else. I never did it, but what it said to me was that I needed a challenge,” he says. “I definitely did not leave Arup because I was out of love with the firm.”

Wise was a favoured son of the consultancy from the start. “All I knew about the company when I had my 1979 interview with staff director Tom Henry was that Arup designed the Sydney Opera House. Henry asked me what I thought of our lecture theatre at Southampton. I said it was horrendous; and he then told me he had designed it,” Wise recalls. This didn’t do Wise any harm. He joined the firm and it suited him.

“Arup was very liberal in those days, and it’s still in its DNA I hope. It allowed people to do their own thing as long as they didn’t screw up and it was plausibly commercial. My mentors were Patrick Morreau, who took me to listen to music like birdsong by Olivier Messiaen, and Jack Zunz, who summoned me a little like Zeus to his office in the early 1980s to say that he would like us to write a paper together. Thirty years



London’s Millennium Bridge under construction

later Jack and I still meet up for lunch every few months and he’s still teaching me stuff.

“The 1990s were a lot of fun,” Wise remembers. I was doing many of the Rogers and Fosters projects for Arup. It was personally a very fulfilling time. But it got to a point when it was too easy, everyone seemed to believe everything I said and I wondered if I had been feather-bedded and there might be a bigger challenge if I could find it.”

It was Richard Rogers who put the Expedition idea in Wise’s head. “He said he wanted to continue working with me after I

left, and said I’d need to set up a company to allow that to happen. Mike Davies, one of Rogers’ partners, is one of our trustees now.”

Wise accidentally chose a tricky moment to quit Arup as he was the director responsible for the Millennium Bridge. “I said I would finish all the drawings before I went and the day they were done I left.” He was on the bridge a year or two later when it started its wobble on opening day. “I rang Arup and said I would come back to fix it for free, but was told ‘we think we can manage on our own, thank you.’”

It is another bridge, designed at Expedition, which is the project that still gives Wise most pleasure. That is the ethereal double-arched Infinity footbridge in Stockton-on-Tees. “It is less famous but we did it on our own and the superstructure is incredibly slender, though we did benefit from all the fantastic work Tony Fitzpatrick and the team did at Arup for the Millennium Bridge fix after I’d left.

“You pick up awards in this industry, but when we won The Institution of Structural Engineers’ Supreme Award in 2009 for Infinity, that was very special. We had been judged by our peers, who know quite a lot about engineering, and at that moment my heart was thumping with pride for our little practice. To have pulled it off and to be appreciated by our peers did mean a lot. And then we did it again in 2011 with the Velodrome.”



Infinity Bridge, Stockton-on-Tees



London Olympic Velodrome

ever demonstrates the alternatives to the conventional beyond occasionally on one-off projects. We try to keep an experimental mind-set at Expedition every day, every week, but we need to think bigger and capitalise on our lean design abilities to get that thinking as the norm in the market place.

"I think we will have to prototype our industry-changing structural solutions outside the economically pragmatic confines of individual projects. And these prototypes should be a serious pan-industry campaign to get better structural performance, not slavish acceptance of codes which only ever ratchet things upwards and upwards, with more and more fat to protect the world against useless engineers. Why should everyone suffer because of those few bad apples? So I am trying to find combinations of people willing to go on a multimillion-pound adventure."

This would be to prove to a risk-averse management industry that disruptive innovative ideas can lead to better, cheaper, more sustainable, longer-lasting buildings and infrastructure. He knows that without physical evidence, there is no chance industry will change.

"We want to be edgy and experimental, but to do real, good projects. We need to be able to get people to see that you really don't need so much concrete or you really can do what you want with less steel! And you really do need an excellent engineer, not a superficially excellent one."

Wise can see great potential in the contracting sector where there is common agreement among the heavyweight firms that they'd like to do things in a leaner and more efficient way, and there are some parts of industry that he says Expedition can help very quickly. "But you are unlikely to realise anything in construction unless

### Wise on High Speed Two

"HS2 risks being a massive missed technological opportunity. It should be a proper research project – there's a long-enough programme and it is predictable enough to be out there in terms of technical development, whether

it be new designs for sleepers, overbridges, platforms, gantry systems, rolling stock, proper integration with the hinterland and unification of the country either side of the line. If you don't think of it as a technological opportunity but focus on

cutting the development risk, you are bound to end up with conservative overdesign, the same as we (or the French) did yesterday. HS2 should not be running scared of creative engineers who can bring the project in cheaper, faster and better, but it is."

there is a physical, demonstrable, measurable prototype. And because these are expensive, and research councils won't often fund them, we are getting to the point when we need venture capital and collaborative research between companies which normally compete against each other to create next-generation prototype structures. We have a list of 30 or so 'low-hanging fruit' options that we could start this week and that would be sure-fire winners."

### Disruptive influence?

As Wise cogitates on the next steps for his business, he is also considering his own future.

"To be honest, I feel like a fish out of water. People get a kick out of what I am personally able to do with engineering, but in reality they think I'm a bit of a nuisance. People are respectful and warm, but beyond asking 'what do you think?' they quite often don't want me on a project because there is a false perception I am too strong-willed and disruptive... which of course is completely wrong. I just want a fair and frank exchange

of views and a great project at the end.

"I love it when I can experiment with some architects, some clients, but it is all too rare. On projects such as bridges, where you are dealing with public money and, of course, engineers are visibly in charge and visibly accountable, they often don't understand the benefits a nominally disruptive engineer brings to the table. It's too risky, they think; of course good design is anything but that. They want predictable, but I think what they get is overdesigned and expensive. I think HS2 risks being a prime example of this: nothing ventured, nothing gained.

"It may be though that I am not disruptive enough," he worries. "Look what is coming out of Google and Tesla. Where's the engineering equivalent of those guys?"

Wise considers for a moment whether he wants to stop being a director. "I've been one for over 25 years; maybe it would be nice if someone else was in charge." There's a short silence, but then he dismisses the thought, knowing he would hate that option.

So he's contemplating more brick wall dodging to allow himself to learn new skills and stretch his abilities.

"What skills do I need these days? I need anything physical and outdoors because nature is great for engineers. I still open the bowling for the Reigate Pilgrims Cricket Club but I'm getting ridiculously slow. I need more time. And now I am an amateur astrophotographer, from my shed in the garden.

"Astrophotography is a crowdsourced hobby, and that's a new skill for me. You ask people on the internet (like NASA) and they tell you how to do it. So now I have a robotically controlled telescope and I found out how to write the control system programme the crowdsourced way.

"What that has shown me is how crowdsourcing can help creativity. Some of this stuff is miles more sophisticated than doing it in an office – and it's free. Maybe that's my way to go forward and find like-minded people."

### Wise on academics

Chris Wise has spent more than a decade working with students at universities including Imperial College London, Yale and, latterly, University College London. He warns of a serious disconnect between academic ambitions and the needs of undergraduates.

"Academics are trained to be researchers, not engineers. Some are great teachers, but that is more by accident than design.

It is unfair to expect engineering academics to understand engineering when they have no actual experience, but then how can they teach students? So students are being short changed and paying a lot for it.

"We need much greater industrial involvement in the education process, not just as visitors but in a way that allows significant involvement in curriculum development.

"My view is that

the Joint Board of Moderators' (JBM) assessment process is not tough enough. If the JBM was really holding universities to account in delivering 21st-century education, it should be de-listing those courses that are not providing that. If that happened, pretty rapidly you'd find universities would concentrate most on teaching their students rather than just their research agendas."