



The future belongs to the curious.

# Exploare <sup>®</sup> H.

A magazine from Hoare Lea

ISSUE 1 SUMMER 2018 HOARELEA.COM





**The future belongs to the curious.**

**“If I limit myself to knowledge that I consider true beyond doubt, I minimise the risk of error but I maximise the risk of missing out on what may be the subtlest, most important and most rewarding things in life.”**

E.F. Schumacher, *A Guide for the Perplexed*

**Places.**

**People.**

**Possibilities.**

**Dubai Expo 2020 / 16**  
Book your ticket to the future.  
**Beecroft Building / 26**  
A humble home for quantum computing.  
**Gas Holders London / 36**  
The constraints of an icon.  
**Shaping my city / 38**  
Birmingham.

**Julian Lloyd Webber / 28**  
Conducting music's future.  
**Fresh perspectives:  
Diana Sanchez / 6**  
In defence of social purpose.  
**Wolfgang Buttress / 8**  
The artist talks bees, portals,  
and NASA satellites.

**A circular tomorrow / 18**  
How far have we stepped  
into this brave new world?  
**X files / 42**  
Air quality vs decarbonisation.  
**The reality of VR / 44**  
The Grenfell community  
DIY SOS build brought to life.

FOREWORD

Designing the built environment puts us at a unique intersection. We span technology, economics, local and global regulation, environmentalism, and the health and wellbeing of society. We craft the stage where lives – billions of them – play out every day.

The privilege, magnitude, complexity, and responsibility of this role can sometimes feel daunting. With every innovation, every development in how we work, and each impactful project, the need for more, better, newer seems to follow. The world feels fast, vast, and often out of control. Despite the pioneering developments they may feature, when designs for spaces take years to come to fruition, it can feel as though there's always more that could be done.

So how do we combat that overwhelming feeling? How do we even begin to make changes that keep pace?

## We explore.

It is a constant truth that children have an inbuilt drive for discovery. As kids we behaved like 'little scientists' – eager to observe and ask "what if" about our surroundings. But, of course, as our awareness of the wider world expands, we become immersed in the practicalities of our lives, and maintaining our capacity for exploration becomes harder and harder. So we need to fight for it – encouraging each other to delve deeper whenever we can.

As engineers, we're sometimes criticised for focusing on the granular detail too often: while it's integral to successful buildings, it can sometimes be frustrating for those who are inclined to focus on the bigger picture...

### But, when it comes to exploration, detail can be everything.

For explorer Ellen MacArthur – who features within these very pages – focusing on single issues out at sea is how she ultimately navigated those challenges that seemed too big to tackle: "You concentrate on solving your problems, or keeping the boat safe, or making sure you take the best route through the storm..."

The romanticisation and simplification of history has deceived us into thinking the world is advanced by lightbulb moments, by 'big' questions, and pioneering breakthroughs. In reality, it's every new iteration, every focused piece of research, every small exploration that contributes to world-changing advancement. The scale and pace of our world – the very thing that often overwhelms us – makes this transformation possible. All we have to do is share these discoveries, journeys, and lessons... and continue to ask what we need to explore next, and – indeed – whether we need to redraw the map entirely.

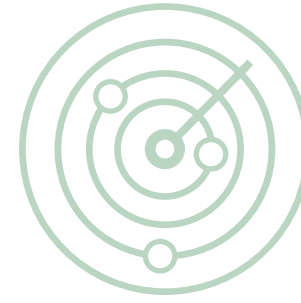


# The trend report.

|  |   |  |
|--|---|--|
| <b>Healthy Housebuilding Report 2018.</b><br>by Hoare Lea, UK Green Building Council & BRE | <b>CONTRIBUTING FACTORS TO PHYSICAL AND MENTAL WELLBEING IN HOMES</b> | <b>WHAT</b> National survey  |
|  | Key:<br>New homes: post 2000<br>Older homes: pre 1945                 | <b>WHEN</b> Early 2018   |
|  | <b>WHO</b> More than 450 homeowners and tenants from all age groups   | <b>WHERE</b> Various age and type of accommodation (houses and apartments) |



## On the radar.



### 1.

#### LONDON ENERGY TRANSFORMATION INITIATIVE (LETI) ENERGY DECLARATION

LETI has launched a voluntary energy declaration, which aims to encourage designers to predict the energy use of their buildings and focus on performance outcomes.

Talk to - [LouiseVille@hoarelea.com](mailto:LouiseVille@hoarelea.com)

### 2.

#### INCLUSIVITY AND THE SKILLS GAP

RAEng and the Science Council has developed a bespoke Progression Framework to actively improve diversity and inclusion among scientific and engineering professional bodies.

Talk to - [JoEdwards@hoarelea.com](mailto:JoEdwards@hoarelea.com)

### 3.

#### AIR QUALITY AWARENESS

Artist Michael Pinsky's 'Pollution Pods' at Somerset House, London, give people a chance to experience the air quality and climate conditions of five cities across the globe.

Talk to - [ChrisRush@hoarelea.com](mailto:ChrisRush@hoarelea.com)

### 4.

#### OVERHEATING IN BUILDINGS

In response to the heatwave experienced across the globe recently, the BBC investigated the impact of overheating and what the industry is doing to mitigate its occurrence.

Talk to - [AshleyBateson@hoarelea.com](mailto:AshleyBateson@hoarelea.com)

## Conversation kickstarter.

**“How do we go from a linear view of how buildings function, to something that’s more honest about what people really use?”**

Valeria Segovia, Design Director, Gensler

**“Imagine a world where your current business model is no longer valid.”**

Iain Trent, Engineering Director, Landsec

Join the discussion at [hoarelea.com/insights](https://hoarelea.com/insights)

## Kaizen corner.

改善

“Change for better: one-time or continuous, large or small.”

Amazon’s ‘customer obsession’ is so embedded in the company’s culture that there’s often an empty chair at meetings to represent the consumer.

Shake up your next internal meeting by assigning a spare chair to the unheard voices that should be considered. Better yet, invite them in... the response might surprise you.

## Hoare Lea is...



### Thinking about.

#### From-scratch residential design.

Improving the speed and efficiency of construction requires the development of pioneering engineering methods across MEP, acoustics, vertical transportation, and beyond. Ideas range from collaborating with product manufacturers on mechanical ventilation with heat recovery systems, to identifying alternative solutions for party walls.

Talk to - [RichardBrown@hoarelea.com](mailto:RichardBrown@hoarelea.com)



### Talking about.

#### Digital twins.

Digital models capable of representing the entirety of a building’s operation can now be created by linking together a building’s performance data, user data, and workflow data. Such complete and connected models – ‘digital twins’ of physical buildings – are allowing us to optimise building performance based on real-time evidence.

Talk to - [AndrewBullmore@hoarelea.com](mailto:AndrewBullmore@hoarelea.com)



### Caring about.

#### Transcending disciplines.

Students of the brand new MEng in Engineering and Architectural Design at UCL have completed their first year. Chosen as a liaison partner (along with Feilden Clegg Bradley Studios), we’re helping to shape the course content to equip students with a cross-discipline skillset and overcome fragmentation in the construction industry.

Talk to - [IanDurbin@hoarelea.com](mailto:IanDurbin@hoarelea.com)

# Harnessing our social purpose.

# The human development argument.



LET'S TALK  
DianaSanchez@hoarelea.com

PEOPLE

Fresh perspectives  
New voices of the built environment



**This is the key: being able to convert current pains and future threats into opportunities for growth.**

I believe one of the main challenges in our industry today is finding ways to create value – rather than just profit – and how we share that value with all spheres of society.

Business schools now teach their students that companies have an overarching social and economic purpose that transcends profit maximisation. This includes producing goods and services to meet needs, creating high-quality employment, or making a positive contribution to the social and physical environment. Arguably, our industry has struggled with this so far because it's a discussion that begins in the ethics and economics sphere.

We all understand how responsible our industry is for shaping, designing, and delivering the places and buildings we live in. Putting this realisation into practice, however, is another matter. I believe we must start to integrate a social perspective into business strategies, translating barriers or needs into opportunities for growth.

Using innovation purposefully and making the most of technological advancements will mean our industry develops not only new solutions, but solutions that are integrated into public policy agendas, along with viable commercial models that ensure scalability and impact.

Unlocking this will demand better ways of working, and a key aspect of this is how we – ultimately – measure success.

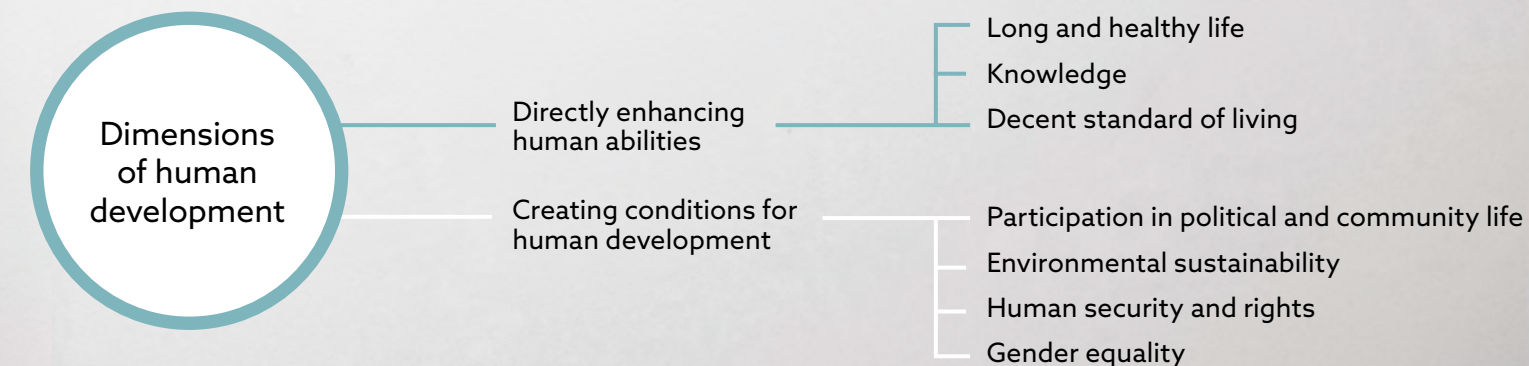
### A bigger boat

Despite the growth of corporate social responsibility, most businesses in our industry consider delivering projects well, on time, and within budget (alongside hitting individual short-term profit targets) the ultimate measure of success. Of course that's vital... but I believe we can, and should, spread this much wider to encompass measures that are even more impactful.

Can we look to other sectors for ways of doing this? Certainly, the 'human development' approach, which proposed a new paradigm for economic policy, is one route. This approach, developed in 1990, shifted the discourse from pursuing material opulence to enhancing human wellbeing; from maximising income to expanding capabilities; and from optimising growth to enlarging freedoms. It focuses on improving the lives of people rather than assuming that economic growth will automatically lead to greater opportunities for all. In essence, it argues that income growth is an important means to development, rather than an end in itself.

Can we use this principle as a definition of success for our industry? The Human Development Index could work for businesses in the same way that the Social Value Act has influenced public services (the Act requires people who commission or buy public services to consider securing added economic, social or environmental benefits). The Human Development Index is certainly a strong measurement tool; it integrates three dimensions – health, education, and income – into an aggregate index. Our work shaping the built environment can influence all three of these areas, so is it time we started measuring these impacts for ourselves? Perhaps including them in our financial reports?

As an economist who is now immersed in the world of building services, I believe corporate social responsibility should, and could, share centre stage with profit. It's a fundamental shift that may take time, but one that's highly likely as an outcome of society's development and evolving priorities. Ultimately, as public policy increasingly focuses on wellbeing and social growth, businesses and industries will start to be held accountable for more than just our profit: in other words, the social impact we make. □





PEOPLE

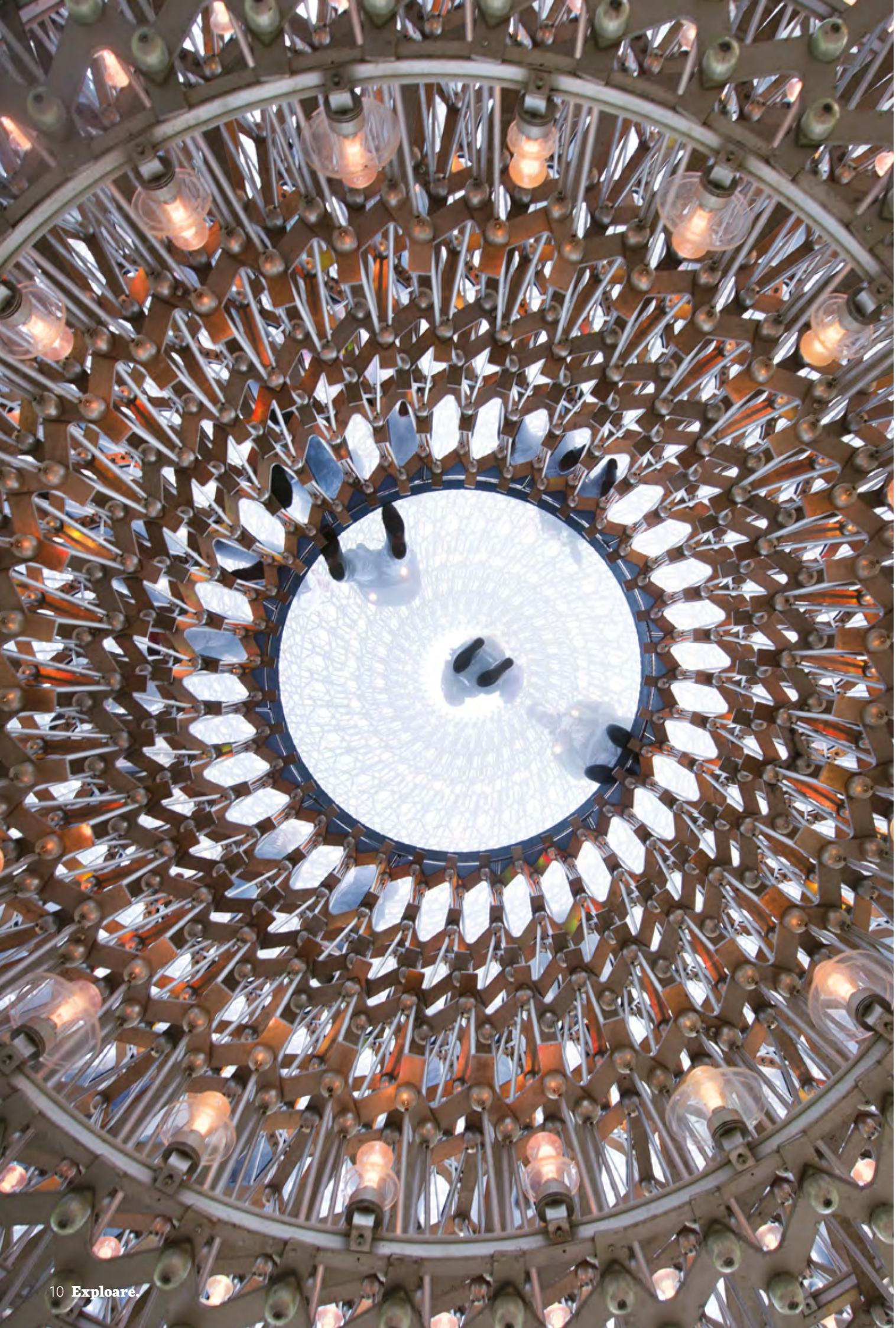
# Mastering the moment.

Artist Wolfgang Buttress creates human experiences like no other. On a sunny day in Soho, we sat down with him to talk portals, honey bees, finding calm, NASA satellites and everything in between.

Photos: Jeff Eden, Mark Hadden, Kevin Luckhurst, Gavin Mallalue







Under The Hive.



**For me, every piece – whether it’s a painting or sculpture – has to start with an idea, a feeling, an emotion. The creative process then simply becomes about trying to find the best, most appropriate, most powerful way to express it.**

Wolfgang Buttress is the kind of artist who asks us to rethink what art can be and do.

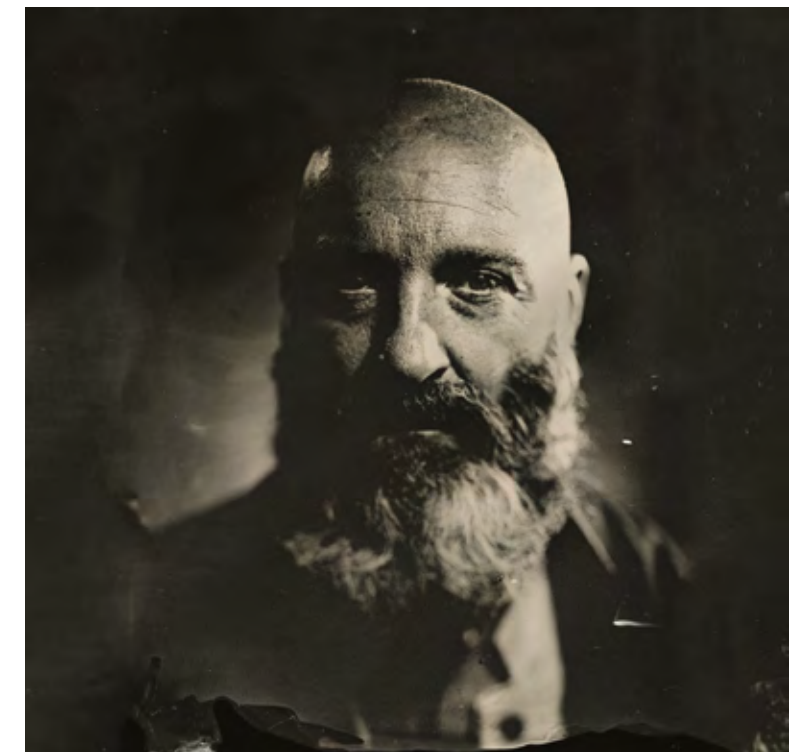
His work weaves together a web of soundscape, sentiment, sculpture, and sensory experience that you’d quite happily stay tangled in for days. Stand in The Hive – the 17-metre-tall feat of engineering created for the 2015 UK Pavilion at the Milan Expo (now a permanent feature at Kew Gardens) – and try not to be moved by the buzzing, thriving, live beehive that makes the space pulsate around you. It’s a raw connection rarely felt in your average gallery.

The concept for the artwork came from the Expo’s theme of ‘feeding the planet’, with Wolfgang choosing to highlight the plight of the honey bee in response. Yet the beauty of The Hive – and, indeed all of his pieces – is how it doesn’t try to tell you something. Instead, you experience it; your feelings change as the live environment evolves around you.

“The way the idea for The Hive came together was incredibly fluid and spontaneous, so in a sense it was only right that the experience you get in the completed space reflects that,” explains Wolfgang. “I knew the sculpture needed a soundscape to create the atmosphere I wanted, and we’d gathered musicians to create it... I remember we were listening to the live sound of the beehive, and we realised the hum the bees were making was in the key of C. Slowly a few people began playing along, and then others joined in. It was amazing. Luckily, we had the microphones on! And so that moment gave me the idea: inside the sculpture, the activity and energy of the bees would trigger these sounds of the piano, the violin, the singing and so on... put simply, the bees would conduct the symphony.”

#### **A life of its own**

Like any great multi-award-winning artwork (the accolades keep on coming three years on), The Hive’s message became bigger than itself, gathering momentum as it resonated with more and more people. The musicians – who had first gathered in Wolfgang’s studio to play along to the sounds of the beehive – formed the music ensemble BE. Together, they produced a critically acclaimed album, *ONE*, which was voted as one of the best of 2016 by *Rough Trade*, *The Guardian*, and *The Quietus*. The ensemble even went on the road, with Wolfgang curating performances everywhere from Glastonbury and End of the Road festivals, to St Mary’s Church in Nottingham and Coventry Cathedral. >>



#### **Wolfgang Buttress.**

UK artist

Based in Nottingham studio

Known for multi-sensory public-space sculpture

Artwork features across Europe, Australia, Japan and the U.S.





Left. The Hive at Kew Gardens.

Below. Wolfgang and Martin Bencsik inspect the Nottingham beehive.



>> "The Hive changed a lot of things for me. From childhood, music and art had been my two great loves, but they were always very separate. I'd put sound in one box and sculpture in another, but in The Hive they both came together. It made me view technology as an enabler – as a way to take everyday signals from the natural world and create an experience that connects us with it."

### Hands on

Wolfgang started his artistic career as a painter, studying fine art at Nottingham Trent University. His paintings are atmospheric, featuring a depth and texture that – with the benefit of hindsight – seem to lay the groundwork for the immersive sculptures that have brought him the most acclaim.

"For a long time I painted and sculpted," he explains. "Learning to make physical things was really useful. After my degree, I did a welding course at my local engineering college in Nottingham. When it finished, I found I wanted to carry on learning so two of the tutors made me artist-in-residence. It was so valuable; I explored how to really use materials – how they work together, what is compatible, and how to combine and connect them. I think I learnt a lot more from that residency than they did from me!"

As the commissions became more ambitious, Wolfgang found himself needing bigger spaces and specific expertise that could help him realise his concepts. "It's great to work with experts – a structural engineer, maybe a scientist, an architect, sound engineers – because suddenly your creative process blossoms, widening to include all these people who are working together and focused on one purpose. It's no longer about thinking you can do everything."

Ever since his degree, Wolfgang has surrounded himself with others. In his Nottingham studio, he employs architects, designers, engineers, and makers: "It's quite relaxed most of the time but then there are moments when we have more people in the studio and there's a real energy. I think, for many of us, it's about the balance of having space and time to think

alone, but knowing when to contrast that by getting together with a diverse set of people to push the idea. I try to work with collaborators who will move my pieces from A to B in a quicker or newer way that I couldn't conceive of myself. I don't think of it as problem-solving; it's about surrounding myself with people who 'get it' and together we work out how to realise the idea. I love it when the artwork ends up going somewhere completely unexpected and, for that, you need other people. When we land on the best way to execute an idea, it can feel like the most obvious, simple thing in the world."

### A simple connection

Wolfgang believes it is this simplicity that allows his work to connect with people, and it's something that's reflected in the form his sculptures take.

"When I start thinking about the shape of a piece, it usually always develops into an 'essential form': a sphere, an oval, occasionally a square. They're elemental shapes... from our blood cells, to our sun and universe. I think they feel right because their form is never-ending – no front, no back, no bottom or top – so conceptually they're pure and engaging. Sometimes I try to force myself to do a completely different shape. But after a few iterations, I always return to those simple forms because they take the audience beyond what the piece simply looks like."

For Wolfgang, this desire to transcend the aesthetic of a piece of art is what's driven his exploration of immersive sculpture. No matter how powerful it might be, 2D art can have a limit in how far it can go – it's harder to 'dive into' a painting, but with a 3D environment the opportunities become boundless.

Nothing epitomises this more than Wolfgang's latest project – which attempts to 'transport' people off of our planet entirely. Called Lumen, and based in Taiwan, the plan is for construction to start during the next six months. It has involved working with NASA researchers to create a sculpture that's brought alive with a lighting and acoustic display. The Wolfgang twist? The display will be orchestrated by live digital signals from two NASA satellites focused on the sun. >>



**I'd put sound in one box and sculpture in another, but in The Hive they both came together.**





**The purpose of technology isn't to 'be' technology, it's to give us a real experience and that feeling of connection we naturally crave.**

"I learnt from The Hive that, if you know what you're experiencing comes from something real and living, the whole thing becomes more intense and engaging. The idea of using signals directly from the sun to create art makes me feel like an excited little kid! And that's the beauty of technology: it can connect you with these incredible elemental features of our world – even our universe – which we otherwise can't experience.

"For good and for evil, technology – especially the phone in our pocket – is a portal. The purpose of it isn't to 'be' technology, it's to give us a real experience and that feeling of connection we naturally crave."

**Body language**

The connection Wolfgang's work creates goes beyond the boundary of language. "I think, sometimes, what artists can do is distil an idea down to its very essence... and then make it tangible for people."

Indeed, it's the 'unseen' – the evolving sounds, the sensory aspects – in each piece that is fundamental to their success. "The soundscapes create another level of experience," says Wolfgang. "Without them, I couldn't craft the calm I'm trying to create in what are usually quite chaotic surroundings.

"It sounds strange, but serenity requires sound. My research for The Hive was probably what first unlocked that for me. The vision for the piece didn't really come until the first time I picked up a frame of bees from a beehive. I expected to be scared, but what struck me was the sheer life of it: the movement and, most powerfully, the sound of it. It was this intense drone-like noise that was simultaneously intense and calming. The sound created this connection between myself, the bees, and the earth... almost as if the hive itself was a conduit to me feeling closer to nature."

Sound is completely 'of the moment' – everyone responds to it in their own way. In Wolfgang's work, it creates a kind of personal intimacy and connection. For large-scale sculptures such as his, which allow for big groups of people to experience them at one time, crafting that calm and space for reflection is vital to their impact.

So does Wolfgang like to reflect on his own work?

"Ha! Of course you get a sense that you've achieved something, and perhaps a year later I might go back and it feels OK. But, for me personally, in the moment I'm always critical of my work; I'm thinking about how I could take it further or refine it. I don't sit back and really feel satisfied – if I felt that I'd stop."



Wolfgang in Reverie, an immersive temporary sculpture created for Oliver Spencer's Soho store.

This constant urge to move forwards feels perfectly apt for an artist like Wolfgang... especially one who creates environments characterised by the fluidity of ever-changing soundscapes. His work is anything but static.

"I think there's often an illusion – especially in the west – that things are solid and permanent. These buildings and environments we're creating might, at best, last 100-150 years, but in the scale of our world that's nothing – it's a blip.

"So, as long as something is sustainable and can evolve, I really believe we shouldn't be afraid of the temporary. It's a concept I experienced in Japan two decades ago. I still remember the bitter sweetness of wandering through Tokyo during peak cherry blossom season; the entire city was this delicate pink metropolis and it was more intense because you knew in two or three days it would be gone.

"And, although I don't really feel true satisfaction when I finish pieces, I have to confess to a similar moment when The Hive came together. The scaffolding had come down on this vast sculpture we'd built, everyone who'd made it happen was there – the musicians, the sound engineers – the meadow was planted, the buds were just coming through, the sun was going down, and we switched on the soundscape... In that moment, I had one of those out-of-body experiences. You can't plan them, and they're so, so rare, but for a time life is almost super real – you feel as if you're watching it through a lens and you know it will be etched into your brain forever." □

**LET'S TALK**  
MikeBedford@hoarelea.com

Inside The Hive.





| <b>World Expo 2020, Dubai.</b> |   |
|--------------------------------|---|
| The client                     | Expo 2020   |
| The architect                  | Hopkins   |
| The expertise                  | MEP, Acoustics, Lighting Design, Façade Access, Vertical Transportation, Security, ICT, Fire Engineering                |
| The challenge                  | To explore pioneering solutions, drive the site-wide Sustainability Management Plan, and design for future flexibility. |
| The sector                     | Arts, Culture & Heritage  |



**Cir • cle** [sûr'kel] n.  
1. A plane curve, every point equidistant from a given fixed point; the centre. 2. A circular or nearly circular course; circuit; orbit. 3. A series or process that finishes at its starting point or continuously repeats itself; a cycle. 4. A sphere of influence or interest; domain. [Middle English cercle, from Old French, from Latin circulus, diminutive of circus, circle, from Greek kirkos, krikos.]



#### POSSIBILITIES

**The next time you have a spare five minutes, type 'world population clock' into a search engine. In a few clicks you can be watching a live counter that increases in number faster than every second as it tracks the world's population. Once you've got your personal reaction – likely to be any combination of horror, motivation, or awe – under control, it's hard not to think about what needs to change as the number on that counter hurtles towards 10 billion...**



Photo by Rob Curran on Unsplash



**Our established models – for everything from communication, education, healthcare and food production, to energy supply, government and the economy – are already creaking under the weight of modern challenges. Even the optimists among us can agree that a few decades from now could see a combined environmental, economic, and humanitarian challenge of unprecedented proportions...**

The solution that currently seems best placed to redirect our course away from this future? The circular economy. In the last few years, key players across the world have woken up to the need for a different model that can supercede our current linear economy of making, using, and disposing of materials.

#### Complementing causes

New York Times best-selling author Kim Stanley Robinson says it best: "In terms of dodging a really bad sixth mass extinction [we] need to decarbonise fast. The technologies to do this include women's rights (this stabilises population) and economic equality (this reduces impacts of poverty and over-consumption). Justice is a climate-change technology of great power, so there is no need to set up false dichotomies as to which good cause we support.

"The good causes reinforce each other and we need them all at once... We just have to figure out a way to pay ourselves to do the work of survival."

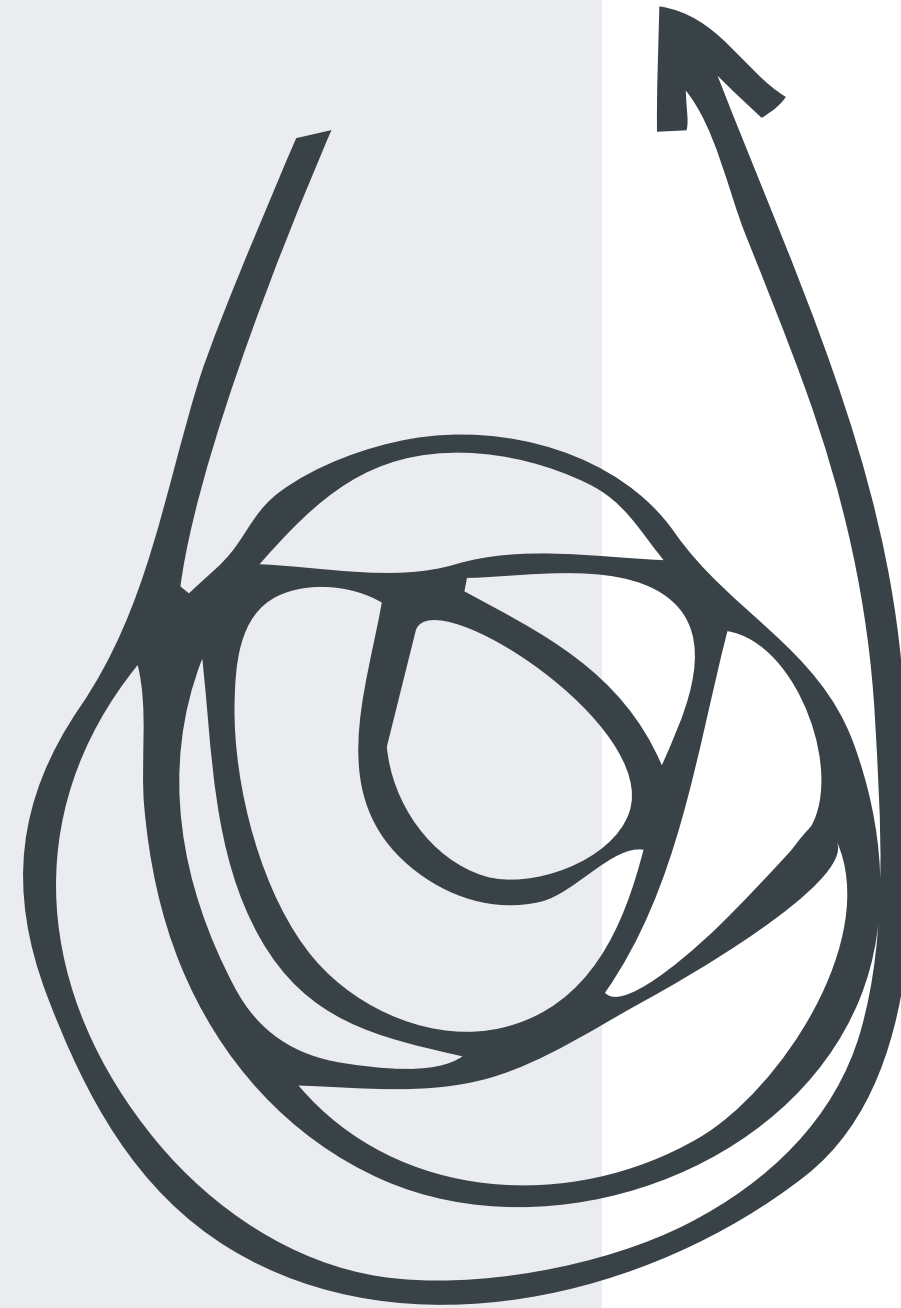
The circular economy addresses the great challenge of our age by pursuing that sweet spot: where altruism collides with return on investment. It also aligns perfectly with the principle of creating value from sustainability – something we in the built environment have been striving towards for years.

The added benefit of the circular economy? The concept and its realisation are actually becoming quite... well, cool. The out-of-touch 'hippy' eco warrior stereotype is dead: there's now an undeniable social status to be gained from buying the Adidas trainers made from ocean plastics, or driving around in the latest electric car model.

#### Inevitable change

Like any paradigm shift, it's when the mammoth corporations of the world get on board that people start to take note: Google, Nike and Unilever are just some of the nine global partners working with the Ellen MacArthur Foundation to accelerate the move to a circular economy. The real turning point came when the United Nations actively put the circular economy on the global agenda: in 2017, PACE, the Platform for Accelerating the Circular Economy – hosted by The World Economic Forum – was launched. Most significantly? It's co-chaired by the heads of the Global Environment Facility, UN Environment, and the CEO of Philips, making it a public-private collaboration.

While China has had circular economy legislation for many years, this year the EU released a new version of its circular economy package, and France launched a national circular economy roadmap... It's clear change is coming to Europe. >>



## 2 minutes to understand: the circular economy concept.

"A linear economy makes, uses and disposes of materials. Conversely, the circular economy looks at all the options across the chain to use as few resources as possible in the first place, keep resources in circulation for as long as possible, extract the maximum value from them while in use, then recover and regenerate products at the end of service life."

The fundamental argument for circular economy business models is that they align both environmental and profit-making gains by utilising:

#### 1. Design thinking.

Creating processes that use as few resources as possible.

#### 2. System thinking.

Keeping resources in circulation for as long as possible.

#### 3. Product life extension.

Extracting the maximum value from materials while in use.

#### 4. Recycling.

Recovering and regenerating products instead of creating 'waste'.

Some of the relevant theoretical influences are cradle to cradle, laws of ecology, looped and performance economy, regenerative design, industrial ecology, biomimicry, and blue economy.

# When the winds of change blow, some people build walls, others build windmills.

Chinese proverb





### The Ellen MacArthur Foundation: how exploration led to insight and the motivation for change.

Following her retirement from professional sailing in 2010, MacArthur announced the launch of the Ellen MacArthur Foundation to promote the economic opportunity of a circular economy. Now, eight years later, the Foundation is driving the circular economy agenda forward in tandem with decision-makers across business, government, and academia. So what are the current key initiatives for the built environment?

#### Principles to practices

In collaboration with its knowledge partner, Arup, the Foundation aims to demonstrate the value of implementing circular economy principles in the built environment, in order to accelerate their adoption. The 'From Principles to Practices' project is split into two phases. Phase 1 considers the key barriers, opportunities, and enablers of implementing circular economy practices. Phase 2 estimates the added value that new circular investment models can bring to the built environment.

#### Circular cities

Cities and urban areas have great catalytic power to drive the circular economy agenda forward and are also among the greatest beneficiaries of such a transition. The Foundation is conducting in-depth research into circular cities in order to learn more about the opportunities they present and to explore how the benefits can be captured in complex urban environments. [ellenmacarthurfoundation.org/programmes/government/circular-cities](http://ellenmacarthurfoundation.org/programmes/government/circular-cities)



**The circular economy's system-wide implications require creativity as well as expertise in big picture design. The need to put a circular framework around urban development is more critical than ever before.**

**Dame Ellen MacArthur**  
Founder, Ellen MacArthur Foundation

Photo: Martin Allen

>> Despite all of this, when it comes to the circular economy in the built environment, there's not been the wholesale shift you'd expect from the groups of creative, passionate, problem-solvers (excuse our modesty) who comprise it. The impact of this slow adoption hits home when we consider that the construction and operation of the built environment consumes 60 percent of all materials in the UK.

Partly, of course, it's because of the complexity. It's no understatement to say that, relative to the consumer goods industry for example, the built environment is a beast – in terms of design timescales, stakeholders, and value chain etc. As such, it's still very much at the early stages of the circular economy journey... but are there other contributing factors that we need to challenge?

"Collectively across our industry, there's perhaps been an unconscious (and incorrect!) assumption that the responsibility for enabling a circular economy predominantly lies with manufacturers," says James Ford, Hoare Lea Partner, Sustainability. "So much of the discussion involves the word 'materials' – so it's easy to see how this has engendered the perception that manufacturers should take the lead in exploring, pursuing, and delivering solutions."

However, in the much-lauded vision of a 'service-led' future (where, for instance, clients might pay for the productivity levels of a space rather than its square footage and the fittings inside it), the need to design buildings using the least amount of resources, or indeed the most easily recycled or reusable resources, is vital... and it involves all parties.

#### A new scale

This new kind of thinking needs us to focus on the entire built environment value chain. As James explains: "It requires every single party to be on board – the hurdle is no longer the creation of innovative, reusable, or recycled materials, instead it's cross-discipline teams working together to act as a support system that ensures these materials can, and are, used in buildings. Ultimately, this involves collaboration between architects, engineers, suppliers, contractors, and clients to identify the benefits and prove their viability from concept to construction. It's about systems thinking on a much bigger scale than the industry has ever seen." >>



### Possibilities: the material revolution.

A circular economy challenges us to rethink waste. Instead of being something we just throw away, waste can be viewed as any material that is momentarily worthless, superfluous, or unwanted. The key is finding ways to make waste into meaningful volumes that allow for profitable business and the creation of an efficient supply chain. Here's some of the latest innovations:

**Urban mining:** Reusing waste sand and gravel from our urban environment to create building materials.

**Aluminium reuse:** Recycling aluminium from buildings. Amazingly, this requires only five percent of the energy originally needed for its production.

**StoneCycling:** Pulverising recycled building materials from demolition sites to create a new type of stone that can be turned into surface materials and tiles.

**Beverage-carton shredding:** Turning beverage cartons into a material that can serve as both an interior wall cladding and a structural building material, all without using any water.

**Biomaterials:** Taking agricultural by-products and mushroom mycelium, and inhibiting their growth (with reduced light and heat) to turn them into a material comparable to stone and concrete.

**Discarded glass:** Turning post-consumer glass into a powder and using it as an additional substitute material in concrete. This not only reduces carbon footprint but also minimises toxic exposure.



**Motivated by profit? Innovate UK claims resource efficiency measures could add \$2.9tr to the global economy by 2030, with returns on investment of more than 10%.**

>> While our industry has taken big steps in cross-discipline communication in recent years, a streamlined and collaborative process that begins at concept stage and extends through to planning, detailed design, construction and operation is few and far between.

"Westgate, Oxford (pictured right) is a great example of collaboration between client, contractor, and specialists," says James. "We were all focused on minimising waste (both construction and operational) and together we advanced the industry's approach to the reduction of carbon emissions in manufacturing and construction."

"We're now planning and assessing the circularity of materials in all the designs we propose. It feels like a natural role for us to take on – essentially being a facilitator who can prove the benefits of these design approaches to stakeholders and then embed them in designs. For our sustainability consultants, circular economy design is the best solution so far for when 'green chemistry' solutions (the creation of sustainable alternatives to typical construction materials) are just not possible. Digital technologies are allowing us to design, monitor, and maintain buildings better than ever before, and we now need to ensure this translates into being able to extend the lives of the materials that make them."

### The centre of it all

So how else can we change our thinking? One answer might be in choosing not to view the circular economy as a revolutionary new approach and, instead, acknowledging that it's both the culmination and epicentre of almost every trend and development our industry has seen over the past few decades: cross-collaborative design pitches; Government targets for construction efficiency; offsite manufacturing; sustainable accreditation; the challenges of urbanisation; health and wellbeing; the decarbonisation of the grid; the end of single-use buildings; service-led offerings; assessing flexibility vs durability; the user-centred digital revolution; rethinking building operation and maintenance... every single one of these topics contribute to, and would be benefited by, a circular economy approach. Better still, they complement and actively drive each other forward.

Photos: BDP/Nick Caville



### Seven circular commandments.

- 1 Prioritise regenerative resources
- 2 Use waste as a resource
- 3 Design for the future
- 4 Preserve and extend what's already made
- 5 Collaborate to create joint value
- 6 Incorporate digital technology
- 7 Rethink the business model

Imagine if every presentation, paper, blog, or technical report published across our industry in the next decade not only focused on a particular topic or trend, but also asked the question: "how does this support/enable/further the circular economy?" It would set us on one vast, all-encompassing path to a better (and, yes, profitable!) future.

Our industry is full of people who look at the status quo and not only think "I could fix that", but actually roll up their sleeves and start trying to. So this move to the circular economy is just our next challenge.

The true success we should be aiming for? When we no longer distinguish between the words waste and resource; when sustainable design is just design; and – indeed – when the circular economy becomes the economy. □

**LET'S TALK**  
JamesFord@hoarelea.com





| <b>Beecroft Building, Oxford.</b> |  |
|-----------------------------------|--|
| The client                        | University of Oxford   |
| The architect                     | Hawkins/Brown  |
| The expertise                     | MEP, Sustainability, Fire Engineering, Acoustics   |
| The challenge                     | World-leading levels of temperature, humidity, and vibration tolerance, housed on a sensitive site with demanding planning requirements. |
| The sector                        | Science & Research   |

Photo: Jack Hobhouse





PEOPLE

# Crescendo.

**For most of us, being widely regarded as one of the finest musicians of your generation would be enough of an achievement to retire on. Not for Julian Lloyd Webber... his bar is higher than ever.**

Photos: James Cheadle, Nick Robinson, Conservatoire Press Office





**One of the most celebrated British cellists, a much lauded conductor, and passionate campaigner for access to music... when Julian Lloyd Webber became the Principal of Royal Birmingham Conservatoire, it gained a leader dedicated to steering the future of music education in a positive new direction.**



**Q** There's a wonderful quote from you: "if there is one single thread that has run through my life as a musician, it is my resolute belief that music is for everyone." How has this belief driven your work campaigning for government investment in music education?

**JLW** I took up the fight because our children deserve better options than just a very few narrow subjects. Sadly, many jobs will be lost to automation in future – I believe none will be lost in the arts, where performance can never be replaced.

Access to music education should never be limited to those who can afford expensive tuition or instruments. There seems to be a recurring threat to arts subjects in terms of them being removed from school curriculums, and all we can do is continue to speak out. I just wish I could say the people who need to listen are listening!

**Q** As founder of Sistema England (a charity that seeks to transform the lives of children, young people, and their communities through the power of music making), you have demonstrated music's incredible effect on both personal and community development. What have you taken from the experience and what do you think others can learn from it?

**JLW** I've seen first-hand how access to music can lead to incredible change in communities. For example, the Sistema England project in Lambeth transformed relations between two schools where tension and gang culture had been a major problem.

Thinking more widely about the lessons learnt, I think businesses are hopefully seeing how employable musicians are and how valuable their skillsets are in many areas of work.



Recital Hall, Royal Birmingham Conservatoire.

The skills our students learn set them up to be attractive candidates in a wide range of areas. Music has been shown to use parts of the brain and aspects of coordination that are not often used otherwise. And of course the dedication our students are required to show during their training is evidence of their commitment to working hard and high achievement, which they can take into any career and be successful.

**Q** If you had to recommend one piece of 'classical' music to someone who doesn't consider themselves a fan of the genre, what would it be and why?

**JLW** Well the term classical covers 600 years of music! I'd recommend any artist who speaks directly to the audience and communicates their message clearly, with feeling and emotion. Perhaps particularly the Russian composers such as Tchaikovsky, Rachmaninov, and Shostakovich.

**Q** Is there any music we'd be surprised to learn you enjoy, or indeed that you were surprised by?

**JLW** I really enjoy early rock and roll – listening to Buddy Holly and Elvis in particular. I appreciate any artist who is able to communicate effectively with their audience. Music is about communication, not about any particular genre.

**Q** As a musician, what do you feel are the mix of elements that need to come together for people to perform at their best for an audience?

**JLW** I would say that music and sport are very similar because, in order to achieve your best, you have to be well prepared and in the right frame of mind.

A musician needs to learn to apply the nerves and adrenaline that come with performance to their advantage; make them work for you, rather than against you.

**Q** In 2001, you were granted the first busker's licence on the London Underground. How did that come about and what made you want to play that space?

**JLW** Busking on the London Underground used to be illegal and there was some terrible music going on! However, Transport for London decided to launch a scheme to make it official and improve the quality of the music so I helped support that.

The standard of busking is high now, and some artists have gone on to really great things, using busking as their launchpad. I find busking gives artists the opportunity to reach more people, and you can see real potential in many of the artists that you hear on city streets. >>





**I've always believed that music is for everyone; access to music education should never be limited to those who can afford expensive tuition or instruments.**

**Q** You sadly had to retire from public performance due to injury: how has your role as Principal at Royal Birmingham Conservatoire helped with this change in your life?

**JLW** I had always worked in music education and had an interest in making it accessible to all, no matter what their background. How I have moved on since retiring as a performing musician is, in fact, an example of how musicians have to be adaptable; it's so important to have well-rounded training and an attitude that will make you resilient no matter what happens in your career.

I think it's important that musicians are interested in a broad range of areas across the industry from the start, as that will make for a longer career.

**Q** Royal Birmingham Conservatoire is fundamental to the UK retaining and nurturing its musical talent. Does being Principal come with a certain amount of pressure?

**JLW** Our recruitment figures are stronger than ever so the pressure doesn't come from the quantity of applications. However, we're always looking to raise our profile as an institution and to ensure we're identifying and accepting the highest quality musicians to be found both nationally and internationally.

It's certainly an exciting time to be Principal of such a high achieving institution!

**Q** Do you have a 'typical' day in your role as Principal?

**JLW** There is definitely no average day! Each day brings its own challenges. Some days I might be working with our students, and others I might be meeting influential contacts in a bid to raise our profile and generate support. Every day is different! >>







## I think our challenge now is raising the awareness of what we can offer and encouraging people to travel outside of London to find it!



**Q** Congratulations on Royal Birmingham Conservatoire being given a Royal title. How did that come about?

**JLW** The honour came from recognition of the continued excellence of the Conservatoire's work. HRH The Earl of Wessex became our Royal Patron in May 2016 and his continued support played a major part in us receiving the Royal title, the announcement of which coincided with the opening of our new building.

**Q** Do you have a favourite space in the building?

**JLW** We have recently named our concert hall The Bradshaw Hall to reflect a major donation and the ongoing support of local Birmingham philanthropist Dr Keith Bradshaw. I think I'd have to say the hall is my favourite space; although all of the five performance spaces have such distinct characters it's hard to choose! The Bradshaw Hall is certainly the jewel in our crown though; it really takes your breath away upon first sight. When I arrived as Principal in 2015 much of the new building's design was already finalised; however, I had the opportunity to make some suggestions and influence some of the detail – I felt it was important to make sure the new space's atmosphere was both welcoming and confident. We needed to have a building that was self-assured in its presence, and it needed to be timeless rather than appearing dated after a few years.

Right. Royal Birmingham Conservatoire's new state-of-the-art home is the first purpose-built music college to be constructed in the UK since 1987 and the only one in the country specifically designed to cater for the demands of the digital age.

**Q** How does the musical education you're helping craft differ from the one you experienced as a student?

**JLW** We work hard to convey a welcoming atmosphere here, along with a strong sense of community spirit. Tutors and students alike work to help and support each other and we are proud of that sense of family we have created. Everybody here cares for the Conservatoire and is working towards the same goal – we want to achieve success for all.

**Q** You've written eloquently about your father, saying "he loved the company of young people. He adored his students and, today, many testify to his personal help and kindness." Has this influenced you at all in how you've approached the role of Principal?

**JLW** Certainly. I always enjoyed his stories about life at his music college and felt inspired by his passion for teaching. I think I learnt the importance of passing on knowledge and experience to others from my father, and supporting the next generation in their own endeavours.

**Q** What hopes and aims do you have for Royal Birmingham Conservatoire's future?

**JLW** The sky is the limit in terms of what we can achieve together! I believe we now have the best facilities of any conservatoire in the UK, and the standard of our students is the highest it's ever been. So I think our challenge now is raising the awareness of what we can offer and encouraging people to travel outside of London to find it!

**Q** Finally, what excites you both in and outside of the music world right now? Is there anything you're seeing happening elsewhere in other industries or geographies that might change things?

**JLW** I think we're seeing classical music exploding in the Far East at the moment and that is encouraging. The world is becoming better connected and we're reaching a global audience now.

I also think that the development of HS2 will open up Birmingham and encourage more people to this wonderful city with its vibrant cultural landscape – it really has so much to offer, and it's a very exciting time to be in the Midlands. ■

### LET'S TALK

CliveHigham@hoarelea.com







**Gas Holders London.**

|               |  |
|---------------|--|
| The client    | Argent   |
| The architect | Wilkinson Eyre   |
| The expertise | MEP, Acoustics, Lighting Design, Sustainability, Vertical Transportation, Fire Engineering         |
| The challenge | Creating premium apartments and retail spaces set within three Grade I listed gas cylinder frames. |
| The sector    | Residential & Heritage   |

Image courtesy of Argent





**Partner Gary Andrews shares his unique perspective of Birmingham's iconic landmarks and the buildings that have helped shape this vibrant city over the decades.**

## From West...

### Brindleyplace: 2009.

Brindleyplace is a true example of how transforming an old brownfield site can create a brand new 'quarter' for the city. It's a modern-day nod to Birmingham's heritage and I enjoy soaking up the atmosphere of the canal-side cafés, bars, and shops. My personal favourite is 4 Brindleyplace as it has all the right ingredients - a stunning building, great restaurant, and fantastic people-watching opportunities thanks to the newly created public realm. Most importantly, I have fond memories of being part of a great design team - not to mention the architect and client were a joy to work with.

### The Cube: 2010.

This is one of the city's most recognisable buildings, bringing together offices, shops, a hotel and restaurant. Working with Birmingham-born architect Ken Shuttleworth of Make Architects was a real privilege. It united so many of our experts - spanning lighting, sustainability, vertical transportation and beyond. It was also one of the first times we extensively used digital engineering; it ensured every team could work as efficiently and effectively as possible, and set the standard for many of our future projects.

**Insider tip:** I'm a big fan of the top-level restaurant within the building - great food and panoramic views of the city.

### Baskerville House: 2007

This was a former civic building for Birmingham City Council. As a Grade II listed building, it was vacant for several years after the Council left in 1998. It's now a vibrant office space, with a health club in the basement, and won the Midlands and East Anglia regional award in the Refurbished/ Recycled Workplace category at the 2007 British Council for Offices awards.

### Orion building: 2006.

Orion felt like one of the first truly exciting high-rise towers in the city - part of that explosion of residential buildings that happened just over a decade ago. For me, it represents that moment in time when Birmingham took its place once more as one of the UK's most exciting cities.

### Town Hall: 1882 & 2008.

This Grade I listed concert hall embodies both our firm's heritage and future in Birmingham. Opened in 1834, it was the first of the imposing and grand town halls that we've come to expect from our British cities. More significantly for me, it was the building where our firm's founder, Henry Lea, installed one of the first public-building electrical lighting systems in the world. When I heard we had been chosen to work on its refurbishment in the early 2000s, it felt serendipitous.

### One Chamberlain Square: due 2018.

This is one of the most exciting recent projects we've worked on. The stunning glass building was designed by Eric Parry Architects. It's part of the £500 million Paradise development, which will eventually see eight office buildings and a new hotel constructed for the city over the course of a decade.

# Shaping my city.

## Birmingham.

### HOARE LEA & BIRMINGHAM

There was only one place that could kick-off this Shaping my City series. Birmingham was the original home of Hoare Lea - where founder Henry Lea set up his first office in 1862. Now, more than 155 years later, the thriving Birmingham office continues to work on some of the most exciting buildings of the moment.





...to East.

**Grand Central: 2015.**

This space never gets old, even for a local like myself. It's the first 'greeting' that Birmingham gives to visitors, and it's a memorable one. I remember thinking – given the project's scale and complexity – that it was going to be incredibly difficult for the station to remain open throughout the build; but we did it. The coordination and collaboration between all teams made it possible. There was such a buzz about the city when it opened. Even now, I can't help but take a moment when passing through the centre-piece atrium to appreciate how our Lighting Design team found a way to discreetly illuminate it with less than 8KW.

**One Colmore Square: 2016.**

A really stylish building right in the heart of the Central Business District. It's got a great view of the beautifully landscaped Colmore Square that has a fantastic buzz as soon as the sun comes out. For us, this project was a real achievement in terms of its efficiency and sustainable design: it was classified as BREEAM Very Good, with an EPC rating of B.

**Royal Birmingham Conservatoire: 2018.**

One of the most exciting additions to Birmingham in the last five years, this was a truly complex yet thrilling project... a 3D puzzle of box-in-box spaces. The expertise that our Acoustics and Audiovisual teams brought to it blew me away, and I'm proud to be able to call it a Hoare Lea building.

**College of High Speed Rail: 2017.**

This is a building with a vital job. It's where future generations will be equipped with the knowledge needed to bridge the engineering, design, planning, manufacturing and construction skills gap that Britain faces.

**Birmingham City University city centre campus: 2013.**

Our office has spent many hours working on the myriad of buildings that now make up the university's flagship campus. Watching each one go up, after years spent ensuring each space caters exactly to what the students and staff need, is incredibly satisfying. It's also playing a vital part in the ambitious Eastside project – Birmingham's biggest regeneration scheme.

## Shaping my city. Birmingham.



**I don't think I'll ever tire of walking around Birmingham. Whatever the weather, whether I'm alone or with others, it's a pastime that always delights. There's barely a part of the city centre that doesn't feel like it has transformed and evolved over the time I've been living and working here.**

While I enjoy the green spaces (there are 571 parks within Birmingham – more than any other European city), I have to confess that, as an engineer, it's the buildings that grab me more than anything. I particularly enjoy pointing out all of our Hoare Lea projects to my children as we walk around the city, often choosing a restaurant in one of them to prolong their agony...!

Since the 1700s, Birmingham has been known as a centre of creativity, diversity, and innovation – and I still feel that spirit here today. For me and my colleagues in our city-centre office it's a privilege to work on projects right on our doorstep as well as around the country.

While I've shared only a handful of our buildings here, they're part of a long list of others – each one a reminder of how far we've come, the journey Birmingham has been (and is still) on, and the spaces we've made possible for its people and visitors. □

**LET'S TALK**

GaryAndrews@hoarelea.com

Illustration: Dàlia Adillon





TWO EXPERTS: ONE BELIEVER - ONE SCEPTIC

# The X files:

## Is air quality the new carbon?

**The believer.****EIMEAR MOLONEY**

EimearMoloney@hoarelea.com

For at least the last 20 years the construction industry has made significant progress in understanding and reducing the impact of buildings on the world's carbon emissions. Regulation has been introduced and assessments made, all with the aim of reducing carbon dioxide emissions from buildings – and that's been incredibly important.

But there has been a massive shift in what a healthy 'sustainable' building actually means. No longer is this just based upon its carbon emissions. There is a bigger, more important – and potentially fatal – issue at play. This issue is seen as so important to regulatory bodies that there's talk of recommendations being introduced to actually increase carbon emissions in buildings in order to counteract this new evil.

This evil? ...all contained within the air we breathe. Air quality is the new carbon. The 'baddies' in our air include VOCs (volatile organic compounds: gases from certain solids or liquids), NO<sub>2</sub> (nitrogen dioxide) and PM2.5 (particulate matter). The list is extensive and the solution is complicated.

**No safe limit**

The impact of these particulates has long been discussed but it's rapidly gaining traction as more and more evidence comes to light of the negative impact of bad air quality. For instance, PM2.5 is so bad for your health that there is no safe limit below which it is OK to breathe. Similarly to regulations for a building's maximum energy consumption, I believe we'll be seeing limits on particulates in the air inside these spaces very shortly. And, be under no illusion, this will impact our designs. A recent study by UCL implies it's impossible to have a simple, naturally ventilated building in the City of London and keep within EU guidelines for PM2.5 levels. In fact, some predict CO<sub>2</sub> levels should be allowed to rise above current 'safe' limits within a room to reduce the impacts of the worse air quality from outside. All of this is likely to increase energy-use and hence carbon. The argument is there – air quality is the new carbon.

**The sceptic.****TUNDE AGORO**

TundeAgoro@hoarelea.com

Both CO<sub>2</sub> and particulate matter (PM), alongside a few other 'baddies', are recognised sources of poor air quality. According to recent research and evidence from Harvard University, in addition to causing illness, increasing the level of CO<sub>2</sub> within a building can significantly reduce productivity, as cognitive ability to make strategic decisions is diminished. This calls into question the suggestion that CO<sub>2</sub> levels might be allowed to rise within our buildings to counteract impacts of poor air quality. We cannot solve an air quality problem by exacerbating a ventilation and climate-change issue.

**The health and wellbeing argument**

While air quality (indoor and outdoor) plays a crucial role in promoting our general health and wellbeing, other factors all play equally fundamental roles, including: access to daylight, water quality, thermal comfort, acoustic performance of spaces, agile work settings etc. According to the World Health Organisation: "health is a state of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity". Therefore, looking beyond factors that impact on just our physical wellbeing, our buildings must support the total person – our complete wellbeing.

Without a doubt, any new or universal metric for defining/ benchmarking what a sustainable building design could look like must at least cover all three aspects of wellbeing – especially given the shift of priority towards wellbeing across all levels in the industry. Reductive strategies and approaches with regards to building design and tackling environmental sustainability have only taken us so far. We must now embrace a more holistic approach if we're to drive natural, human, social, physical, and economic capital; that is, securing and towing a sustainable trajectory.

Air quality, as an isolated measure, certainly can't be the new carbon. We know "healthy is the new wealthy" and, therefore, I dare say – health and wellbeing is the new carbon.

Photo by Simon Hutsch on Unsplash



This autumn, the latest series of the BBC's *DIY SOS: The Big Build* will feature the Grenfell Community Project. A new boxing club and a two-storey community building – designed and built by volunteers with company donations – will give residents valuable communal spaces. Recently, we took our virtual reality (VR) setup to the construction site to bring the designs to life for all involved and, in the process, were reminded of the extraordinary power of VR...

POSSIBILITIES

# Motivation and morale.

The reality of VR.



What we should do is bring every single person on the job to look at this, so they can see what it is they are heading towards. Wow! I can see the air conditioning units, the artwork on the wall, the windows with the sunlight coming through... Absolutely incredible.

Nick Knowles

## Karam Bhamra:

"We all see and hear so much about the use of virtual reality in construction nowadays that it's easy to forget how powerful it can be. Even for me, who works with it regularly, there's still nothing like putting on the headset and suddenly being transported into a completely new space.

"Our London office had volunteered its expertise to the DIY SOS project. Almost all our specialisms were helping to design the spaces, so it felt right when my team got the go-ahead to create visualisations as well. The construction stage was going to be just as tight as the design process had been, so we knew the hard-working build team would eventually need a morale boost; giving them a full VR experience (rather than just 2D visualisations) was the way to go.

"The process of creating the virtual environment was unlike anything we'd undertaken previously. Typically, we receive detailed agreed plans, interior layouts and product specifications. However, for a project like this – where every material is sourced for free – the design process can be very 'sketchy', so we set out working almost blind! As our teams fed us detailed design and the architect got more information about the proposed flooring, finishes, furniture, and paintwork, we quickly generated drafts and revisions... producing them faster than ever before, right up until the day we were due on site.

"The energy on site sky-rocketed that day. After experiencing the VR, the team and community members compared their experiences, pointing out their favourite aspects and excitedly working out how that translated to the build taking place around them. The interior designer even suggested changes after seeing what aspects were working. It was a reminder of how taking information and making it 'real' is often the most effective injection of morale people on a project can get." ■

## LET'S TALK

KaramBhamra@hoarelealea.com

HOARE LEA 

**Engineers of human experiences**  
Hoare Lea is an award-winning engineering consultancy with a creative team of engineers, designers, and technical specialists. We provide innovative solutions to complex engineering and design challenges for buildings.

Irrespective of the scale or complexity of a project, we provide a full range of MEP, environmental, and sustainability services, bringing buildings to life and ensuring that they perform in operation as well as they look.

**Locations**  
Abu Dhabi, Birmingham, Bournemouth, Bristol, Cambridge, Cardiff, Doha, Glasgow, Leeds, London, Manchester, Oxford, Plymouth, Madrid (associated office).

**Expertise**  
Acoustics, Air Quality, Audiovisual, Building Physics, Digital Engineering, Expert Witness, Façade Access, Fire Engineering, Intelligent Buildings, Lighting Design, MEP, Operational Engineering, Performance, Property Services, Research & Development, Security, Sustainability, Utilities & Energy Infrastructure, Vertical Transportation, Vibration.

**Sectors**  
Arts, Culture & Heritage, Courts, Data Centre & Mission Critical, Defence, Distribution, Healthcare, Higher Education, Hotels, Manufacturing & Process, Prisons, Residential, Retail, Schools, Science & Research, Sport, Transport, Workplace.

Designed and produced by Hoare Lea  
Copyright © Hoare Lea 2018

**Exploare.**  
The future belongs to the curious.  
Challenge accepted.

This magazine is produced utilising Pureprint's environmental management system that minimises the impact of printing on the environment and is a guaranteed, low-carbon, low-waste, independently audited process.

Pureprint Group is a CarbonNeutral® Company, is ISO 9001, ISO 14001, and FSC certified.







---

## **Exploare.**

---

MUSIC'S FUTURE WITH  
JULIAN LLOYD WEBBER

---

THE CIRCULAR ECONOMY  
WITH ELLEN MACARTHUR

---

SOUNDSCAPES WITH  
WOLFGANG BUTTRESS

---

BIRMINGHAM'S BUILDINGS  
WITH GARY ANDREWS

---

SOCIAL PURPOSE  
WITH DIANA SANCHEZ

---

THE REALITY OF VR WITH  
KARAM BHAMRA

---