



Interior of ARM HQ at Peterhouse Technology Park, Cambridge (Scott Brownrigg)

REPORT

Future Cities Forum

Science and Technology Cities

with our main speaker Stephen Dance, Director, Commercial Adviser Team,
Infrastructure & Projects Authority

January 2021

With thanks to our contributors:





Stairwell at Oxford University's Biochemistry Building (HawkinsBrown)

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Astrazeneca teaching lab at Cambridge's Biomedical campus (Herzog de Meuron)

Introduction

The year 2020, with the shock of a global pandemic, has put health services and life sciences research teams at centre stage. While investment into these sectors from governments, investors and real estate developers had been growing before Covid-19 broke out, the urgent search for vaccines, call for joined-up test and trace data collection, and the front-line exposure of hospital ICUs, has highlighted the vital role health science and technology infrastructure plays across civilisation – and our cities.

We are now in 2021 and have left the EU. Leading scientist and Director of the Wellcome Trust, Jeremy Farrar, stated:

'We are no longer a member of the European Union, but we all appreciate that international collaboration in science and research is more important than ever...for collaboration to flourish a strong deal for science must be agreed as quickly as possible, with full participation in the EU's next research and innovation programme, Horizon Europe, at its core. Whatever the negotiations may bring Wellcome will be helping researchers work together wherever they are. Wellcome grants can be used to cover visas and permits.'

Future Cities Forum's 'Science Cities' and 'European Technology Cities' discussions in 2020 debated the challenges of sustaining success in science and technology with a focus on creating the best places and campuses for R&D. The invited panellists discussed how we might best plan, develop and join up the Arc between Oxford and Cambridge and how to provide the right infrastructure and housing for expanding communities in this knowledge-rich region - which contains world famous universities, research institutions and science-led businesses. The discussions also compared approaches to development and innovation in the UK with practices in Sweden and Germany.

Our discussions were led by the UK government's Infrastructure & Projects Authority.

Contributors included universities (as land owners and as developers), institutional investors, teaching hospital trusts, life sciences consultancies, urban planners, architects, master-planners and leading civil engineering contractors.

Future Cities Forum research questions

According to the UKRI Infrastructure Fund, research and innovation infrastructure is fundamental to the UK's wider ambition of delivering of increasing investment in R&D to 2.4% of GDP by 2027.

It states that the 2020 Government Research and Development Roadmap highlighted how UKRI will provide a long-term pipe line of Research and Innovation infrastructure investment projects for the next 10 to 20 years. At the last Budget in 2020 the government made a commitment of increasing public investment in R&D to £22 billion by 2024 to 2025 'to cement the UK's leadership in science and technology ranging from nuclear fusion to electric vehicles and life sciences.'

These projects according to the UK Government will include funds for new labs, campus buildings, support facilities and data centres, as well as a commitment to levelling-up investment across the UK. Collaboration between universities, hospital trusts, corporate R&D leadership and smaller private sector technology companies and investors will be paramount.

Future Cities Forum research suggests that the landscape for investing in and developing science and innovation parks has probably never been stronger. Recent activity has included:

- Trinity College Cambridge selling part of the holding in the Cambridge Science Park to China's TUS Holding (in 2019)
- US investor Angelo Gordon linked with Trinity Investment Management to buy five sites in 2016. Blackstone / BioMed Realty owns Granta science park / Babraham Institute near Cambridge, and is looking at opportunities to invest in Oxford and more widely across Europe.
- Magdalen College Oxford took full ownership of the Oxford Science Park at Cowley in 2017, buying out investor M&G Real Estate. While both Nuffield and St John's Colleges in Oxford are developing sites close to central Oxford which will be mixed-use residential campuses with a research and office core.
- In Manchester Bruntwood SciTech has partnered with pension fund investor L&G to expand science and business parks in UK cities – and in 2020 became an investor in Birmingham Health Innovation Campus in Selly Oak.
- In Europe in 2020 AXA Investment Managers bought science park operator Kadans Science Partner, a Dutch company which owns 150,000 square metres across 20 locations in Germany, Holland and the UK. The company has an additional seven land holdings.

According to the Financial Times about half of the UK's 100 or so science parks are owned by or affiliated to universities.

The government outlined its ambitions for the economy of the Oxford-Cambridge Arc in a March 2019 policy paper, signalling the importance of collaboration. This said:

'...building on strengths in individual parts of the Arc, especially in science, technology and high-value manufacturing there is potential to transform the region into a world-leading economic area, acting as a test-bed for innovation.'

The area currently supports 2 million jobs adding £111 billion GVA to the UK economy each year.

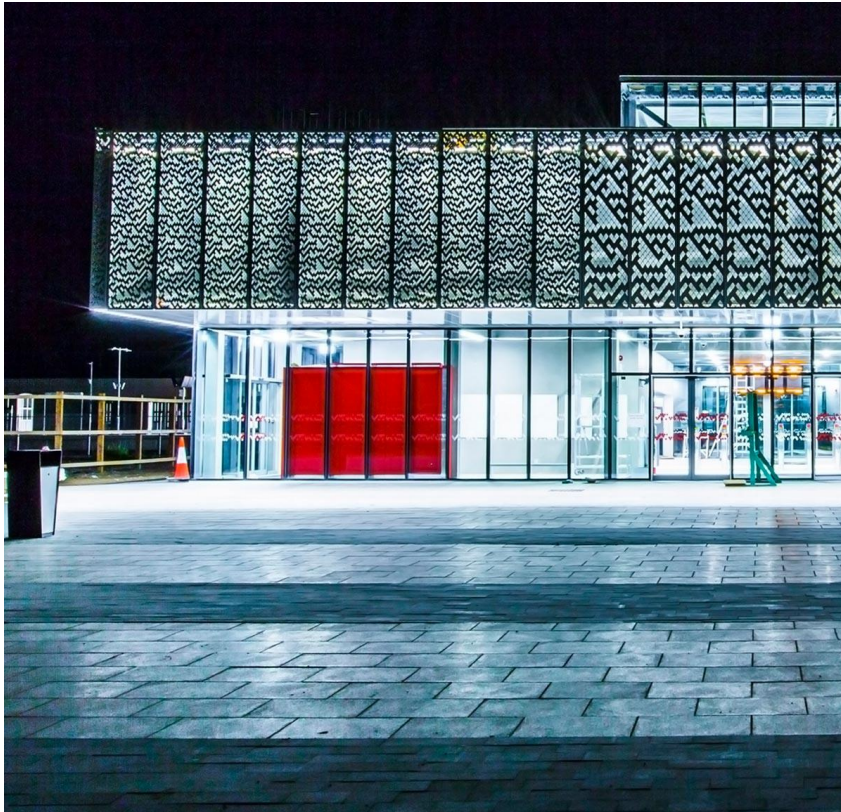
There are significant challenges in achieving sustainable growth of economy and housing, as the then CEO of the National Infrastructure Commission, Phil Graham, stated in his address to Future Cities Forum in June 2018 when he said that housing and infrastructure planning must be linked closely to jobs.

Questions among others in our 2020 Science Cities debates included:

- 1) How will investment post Covid-19 affect the growth of our leading science and technology cities?
- 2) How do we create a balance of knowledge clusters across the Arc with new university and R&D campuses?
- 3) How do we deploy latest thinking in transport technology and innovation to attract medical technology companies to re-locate to science innovation hubs?
- 4) How do we create 'beautiful housing' settlements of scale for the Arc that respect the environment and embody high standards of place-making?



'Science Cities' Future Cities Forum at Newnham College Cambridge



Cambridge North station (night) – courtesy Brookgate

Science Cities and Connectivity

Transport connectivity has been key to planners thinking about how to maintain and grow successful tech cities. Future Cities Forum asked our contributors these questions:

- How important is good connectivity for investment?
- Has there been better transport planning around science cities in Germany?
- Post Covid-19 how can we get the balance of private and public investment in transport infrastructure right?

Schroder UK Real Estate Fund's Head of London Makoto Fukui at our November Future Cities Forum suggested that while the infrastructure between Cambridge and Oxford could be improved, the direct connection to London was a plus for investment:

'It was the new station at Cambridge North acting as a driver for the wider area development and across Cambridge, that was a main spur for our recent investment there as it provided a direct connection to London. Cambridge North is being developed by Network Rail and Brookgate as a 34-acre mixed use regeneration site including a hotel, office buildings, residential development and

some public facilities. Our rationale for investing was clearly driven by the world class university and because Cambridge North will be part of an existing ecosystem that is already one of the largest clusters of tech and life sciences businesses in the UK.'

An important question in our debate was over how the UK can compete for connectivity and environment with the progress of German technology cities? Lambsquay Consulting of Cambridge's Simon Payne, made comparisons with the German approach to innovation campuses:

'We are competing on a world stage so how we compete on the quality of life, whether it's social, cultural, academic infrastructure-led, or scientific, is important. Germany and Heidelberg in particular have been very strong on this. One example is how Heidelberg has taken the 'Internationale bau-austellung' model (International Building Exhibitions experimenting with urban and regional development) and applied it as a 'living lab'. A good example is the Patrick Henry village, a former US army base six miles out from the old town which is a self-contained place developed as a 'city for knowledge' with homes for 10,000 people and 5,000 jobs.

'Taking the IBA concept, the Heidelberg authorities have been able to experiment with autonomous vehicles on the campus alongside walking and cycling, and a decarbonised energy network. This makes it a strong model for sustainability and knowledge innovation. These IBA projects are done within the context of an international advisory symposium, and Carlo Ratti the Italian architect is involved. The question is how do we raise the debate in the UK on quality and innovation? Covid-19 has propelled forward us on this debate to 2030 in terms of how we live, so now is a good time to have this discussion on how we develop our knowledge and tech cities.'



CGI render of PHVision project / Patrick Henry Village (Internationale Bauausstellung Heidelberg / KCAP Architects)



[Stephen Dance, Head of Commercial Adviser Team at the Infrastructure & Projects Authority](#)

I&PA's Commercial Director, Stephen Dance, gave an update at our October 2020 forum on connectivity projects for HS2, the Oxford- Cambridge Corridor, the Thames Estuary, Lower Thames Crossing and driving economic growth through broadband roll-out.

In his current role Stephen leads a team of commercial advisers, providing expert advice to HM Treasury, the Cabinet Office and other government departments to improve the performance of project delivery across Infrastructure, Enterprise and Growth, and Public and Security services. Current I&PA responsibilities include Oxford - Cambridge Corridor development, HS2 stations development and leadership of the Transforming Infrastructure Delivery Programme. He is also a non-executive director of Local Partnerships LLP, a joint venture between HM Treasury and the Local Government Association.

Stephen said there will be some tough choices to make in terms of investment decisions post Covid-19 '...we have to get the public and private investment right around this. We have hospitals to build as well as the roads and railways of the future, so we have to think hard where we put our spending'.

'The question perhaps to pose,' Stephen said 'is the extent to which the infrastructure investment might change following our response to Covid-19. When I think about infrastructure - the norm has been to talk about this in terms of transport - and this is all about connecting physically - but there has been much less emphasis on broadband - the benefits of which we have been enjoying over last few months because of Covid-19.

'From a government perspective there is no rowing back on infrastructure investment but affordability is an issue now with more emphasis on prioritisation and timing - but no less ambition. You will have seen announcements about hospital investment which is great for health campuses - but also more traditional economic infrastructure around roads.

'The extent to which we are putting enough emphasis on virtual connectivity - telecoms and digital infrastructure - is it enough? Maybe we should be thinking more about what happens in this space in the next few years?'



Oxford Parkway station – western end of the East West Railway connecting to Milton Keynes and Cambridge (Chiltern Railways)

Costain's Head of Transport, Sue Kerslake joined the debate revealing that infrastructure projects have not been held back by Covid-19 and that the UK is entering a new era of transport projects being undertaken in innovative ways:

'Covid-19 has been a silver lining for the infrastructure industry and especially now with the UK government's 'Project Speed. We are approaching projects in a more innovative way, it's not just the 'same old' but it is more agile and more decisive and this is across the country and across all modes. The infrastructure of east west connectivity is being approached as a rail project properly now. It is a regeneration project that takes in housing and education too - that's what infrastructure connectivity is all about and we are pointing in the right way on this.'

Stephen Dance responded to questions on how the procurement of government projects for road, rail and fibre could be speeded up and whether the Oxford Cambridge knowledge Arc would benefit from its own development corporation or dedicated planning authority.

'On procurement there is reform in the pipe line and also for the construction 'playbook'. In a non-EU setting there are opportunities to do things differently and to achieve more simplicity and clarity and allow the UK more say in how it selects contractors. This won't mean competition is thrown out of the door. However, I do not think the laws have been the problem but rather the way

they have been applied has been the problem so we need to change the culture around this. Certainly, this government is very committed to bringing in changes.'

Costain's CEO Alex Vaughan commenting on the new Construction Playbook has stated:

'We are delighted that the Government and industry have come together to jointly develop this Construction Playbook. The Playbook gives us all a framework in which to operate, supporting us to deliver infrastructure in a safer, greener, faster, better and more efficient way. This structured, collaborative framework will support the delivery of our critical future infrastructure to drive both economic growth and to decarbonise our environment. We are committed to playing our part.'

Leaders of science quarters have stressed the importance of good infrastructure to attract innovation companies to take space.

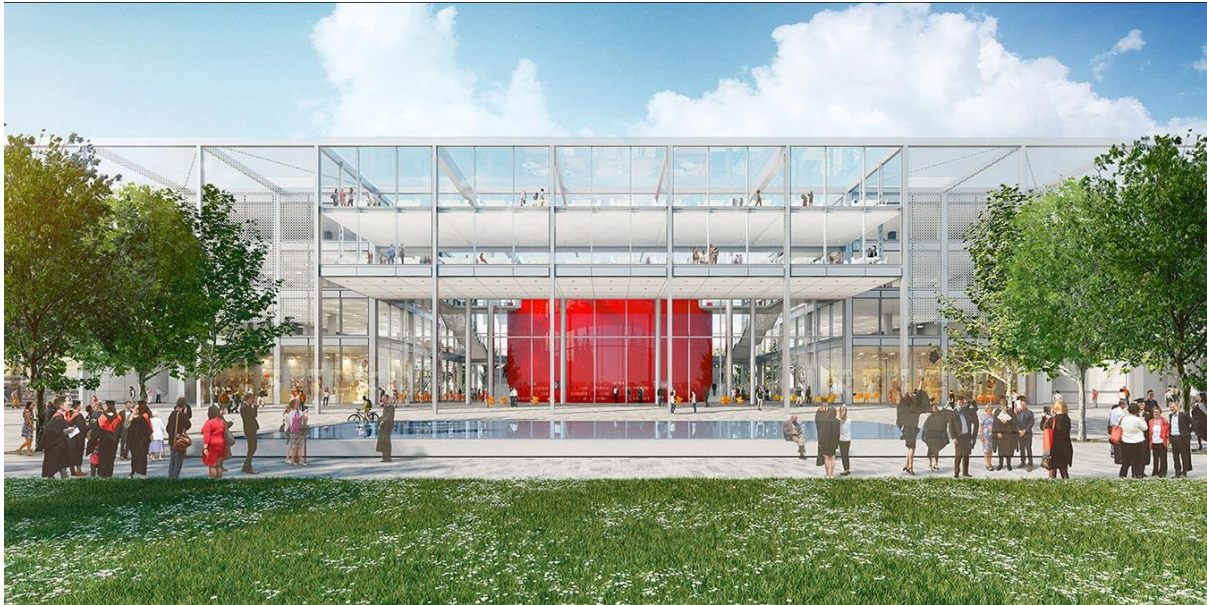
Dr John Williams Managing Director of Birmingham Health Partners pointed this out at the forum stating how important the development of HS2 will be to help drive better connections with London and internationally. This he said was a major attractor for both life sciences and med tech companies and medical talent wanting to relocate to Birmingham - or travel to work at the Edgbaston Medical Quarter.

The city region has a diverse set of population health issues that makes it an outstanding source of data for solving health inequalities. He outlined how important a city it is for attracting the med tech sector to develop transformational solutions for complex health needs.

Birmingham Health Partners is a strategic alliance between two NHS trusts - Birmingham Women's and Children's and University Hospitals Birmingham - and the University of Birmingham where members collaborate to bring medical innovations through to clinical application. The Birmingham Health Innovation Campus which is currently under construction over 10 acres of brownfield land at Selly Oak, is core to these objectives.

Birmingham Health Partners (BHP) is bringing together the University of Birmingham and NHS research support functions. It is a proven centre for translational medicine and data-enabled clinical testing and evaluation and it sits at the heart of a large diverse and stable West Midlands population of nearly 6 million. Managing Director Dr John Williams commented during our debate that physical connectivity was just as important as a strong sense of place, but there was no shortage of land to build on in Birmingham:

'The building of HS2 for connectivity has been very important but we also need to enhance our understanding of the importance of the Midlands Engine. Our investment offer needs to look both ways to influence policy makers in London but also what we have in the Midlands. We have land and space here in Birmingham but also a large pool of highly skilled graduates not just in the city but across the wider Midlands. We can offer interconnected science parks but the connectivity needs to be enhanced. There is a paucity of east-west connectivity currently and we need to be seen as a centre connected north, south, east and west. We have this pull and push to attract investors, highly skilled people and businesses and we can connect in world class infrastructure and in the other areas of expertise of transport and energy.'



CGI of proposed new university at Milton Keynes - MK:U with 'grad lawn' view (Hopkins Architects)

Professor Lynette Ryals, Pro-Vice-Chancellor of Cranfield University also contributed to our forum. She is leading the creation of MK:U, a new university for Milton Keynes. The curriculum will include courses on engineering and technology as well as design and innovation and Lynette would like the university to borrow from the strengths of the apprenticeship training model as well as focus on the commercialisation of ideas.

She has looked with interest at the educational models of Stanford d.school, and Boston's MIT as well as life- long learning programmes in Finland. Lynette would like to see innovation in transport and housing design spring up around the new Cranfield and Milton Keynes Council-backed and STEM-focussed university, where research programmes, particularly in the transport area, will be carried out and tested in Milton Keynes itself. She is optimistic about the proposed connectivity of the Oxford - Cambridge Arc to improve links from East to West of the country and provide a balance to the traditional accent on London and North-South communication.



One Cambridge Square, Cambridge North (Brookgate)

The human factor in expanding science cities

One issue around the development of sustainable science and technology cities is how the working population as well as families can live in a settled and comfortable environment.

- Can planning on housing take account of growing families that want to put down roots in a particular city or settlement?
- Are employees prepared to put up with long commutes to science labs on the outskirts of towns if they cannot work from home?
- What are the standards of public realm and 'high streets' within communities that are now expected because of Covid-19 where work has taken on a more local character?
- What can the UK learn from other European countries on campus planning and how will building 'green' ideas grow this year?

Deloitte's Head of Life Sciences, Mike Standing at our November 2020 Future Cities Forum observed:

'Successful cities have a human component and this means creating stability for the family. The city needs to be stable in creating opportunities for both spouses, to allow them to be able to move jobs within the same city if needs be - and not to have to make a long journey to another city.'

'There is research available from Boston which is interesting about how a city moves from being a cluster to a 'super cluster'. This is driven by economics whereby small start-up companies paying higher rents in the middle of the city then move further out as they acquire more staff and space. This creates a model where they are still part of the cluster but inhabit and operate further out. The age profile may change too with more families attached to the mature businesses as opposed to single people working and living in the city centre.

'A major issue for these successful and overheating tech cities is availability of housing - they need the ability to expand. We need to think about programmatic management which leads me to the question are there any new models in Europe that we in the UK can emulate or is the nature of the city purely a local activity dependent on local conditions?

Makoto Fukui, Head of London at Schroder UK Real Estate Fund added that connectivity between growing businesses is just as important as living standards and environments:

'We have an in-house data analytics team to help us understand how people will commute to a certain building and how close it is to research institutions and universities. Businesses are more than ever having to collaborate with other businesses. First generation tech companies like IBM were located in the middle of nowhere whereas young tech companies now need and want to be located in the middle of cities, close to supporting organisations and facilities.'



CGI of cycling through Waterbeach, the new settlement north of Cambridge (LDA Design)

Partner Heather Pugh at Milton-Keynes head-quartered planners, David Lock Associates, said:

'The scale of the Arc ambition is fantastic and an economic prospectus was published in early October by a group of twenty-five councils and ten universities. However, there is a huge lack of mapping and drawing on housing for the Arc. There is momentum both from the LEPs and from the government, but there is no strategic plan for the Arc. The issue now is how we engage with wider communities on the benefits of being in this knowledge corridor stretching from Cambridge in the

east via Milton Keynes and Bedford to Oxford. Getting these on board will be one of the main challenges.'

LDA Design's Director Bernie Foulkes commented on the need to attract and keep talent to build the success of a place:

'When you look at the model for the Arc, when so many are attracted to the strengths of Oxford and Cambridge rather than the in-between places, how can you extract pieces of city science and infrastructure so that can you deliver the dispersed model when what really attracts people (and investors) is the city itself - great schools, great parks and so on? One of the challenges for us as master-planners of new satellite towns and connected settlements, is how do you make them into places in their own right? How do you create them from new? Northstowe outside Cambridge is doing really interesting stuff, as Karl Fitzgerald (of the Infrastructure & Projects Authority) will attest to, and we are working at Waterbeach six miles north of Cambridge, but how can you get the big investors to move out further afield on the Arc?

Lambsquay Consulting founder and former Director of Environment at Cambridge City Council, Simon Payne added:

'What is heartening in the discussion is the importance of place. Cambridge has had a high quality of life - with green spaces alongside the science parks, colleges and housing - and the universities have been working with the city council to ensure this continues. Where the collaboration works best you get the best result. We need, though, to have answers for the people who ask of new developments: what's in it for me? We are knee deep in Covid-19 which is not best place to find solutions to planning. We need to think long term and perhaps could do well to go back to 1898 to Ebenezer Howard and the Garden City Movement which aimed to create healthy living conditions and which followed on from an epidemic. It is important to take the longer- term view and also look at how other countries are dealing with the recovery from Covid-19.'

The Economic Prospectus for the Arc seeks to enable the area to double its economic output to £200 billion annually by 2050. According to this prospectus the combined output of the science and technology industries with other sectors within the Arc is £111 billion. The Oxford-Cambridge Arc has been viewed as an important development area for science innovation clusters but how these clusters build their brands is being debated. The Infrastructure & Project Authority's Karl Fitzgerald - Project Director on the Oxford Cambridge Arc - described how the Arc needs to grow its identity:

'The Arc concept has been around for some time as has the East West Rail idea. The National Infrastructure Commission took an integrated and far-sighted view about the Arc development potential, but we don't have yet a sense of a clear identity of what sits behind the Arc brand. Whereas people in Boston may have an idea of belonging to the Greater Boston area we need to think harder about the identity for the Arc.

'Milton Keynes, which has come into its own during Covid-19 partly because of the expansive, green layout and attitude to innovation, however gets overshadowed by the international branding of the two heavyweights at each end of the Arc. MK's local economy is greater than those of Oxford and Cambridge but achieving a cohesive sense of the wider Arc for the population and leveraging in private investment is the challenge. The two big universities are recognised globally but they don't necessarily want to be associated in the same way with the rest of the Arc. Identity, place and context need to be worked out.'

Heather Pugh of David Lock Associates commented:

'It was really encouraging to hear a major contractor, Sue Kershaw from Costain, talking about housing and joined-up infrastructure planning. We have found it difficult to engage at an early stage to talk about sustainable transport solutions with Network Rail and other important parties as there between where the housing goes, the jobs go and where the transport infrastructure goes. However, linear infrastructure is going to be needed.'



[CGI of Oxford North development showing innovation hub \(Fletcher Priest for Thomas White Oxford\)](#)

Stephen Dance commented:

'I wonder whether we do think sufficiently laterally at planning infrastructure for future work habits and patterns, especially around last-mile deliveries and so on. William Donger's scheme - Oxford North for St John's College, Oxford University - is a great example of bringing together work, research and play on an urban fringe, using some social infrastructure which is already there.'

'It maybe with new housing developments, the ability to have a work office nearer to home is going to be important within walking distance, so there may well be changes in the way we plan and live. We can all agree that a holistic approach to planning is desirable, but on the Arc you can't take politics out of it. There is a tension between central control and local needs. The Arc will have to happen and some of it may be imperfect, but with leadership and sponsorship from the centre.'

Director of Thomas White Oxford, William Donger, explained:

'We are in final negotiations on section 106 with the city council, but this project is trying to create a new part of Oxford, employment with living and with a small amount of retail. We are lucky that the site is only 15 minutes' walk to Oxford Parkway rail station on the proposed direct line to Cambridge and the current line to London Marylebone. We are putting in £100 million of infrastructure to

support the development. We have been to America to look at how they do it there, and we have had a lot of interest from international investors and we hope the UK will be interested too. We sit between four major routes and we are trying to get away from car-dominated living with investment in pedestrian pathways and cycle-routes. We hope to start construction in January 2022.'

Stephen Dance then responded on the question of integrated planning:

'We have, in the past in the UK, been very good at putting houses where there are no jobs, and infrastructure where there are no houses. This has probably been due in part to systemic thinking from Whitehall. My view on this is that the problem has been partly eroded by the creation of city regions. For example, the Greater Manchester Authority has a regional plan which brings together planning for infrastructure, housing and jobs combined with a spatial plan, and the West Midlands is well on the way to achieving this too. Other areas like Thames Gateway are trying to bring these themes together. With devolved power and devolved budgets, they can start to plan in a more holistic way - as London has done for 20 plus years. However, it's not perfect and there is no political consensus on creating an Oxford Cambridge Arc authority.'

Pro-Vice-Chancellor at Cranfield University and Chief Executive of MK:U, Professor Lynette Ryals, concluded on the issue of sustainability:

'We have a once in a generation chance to build back better and build in some of these (sustainability) principles. We need to think about how we actually live these new systems in a green fashion, and by not encouraging behaviours that undermine the sustainable intent, BREEAM excellence and so on. There is a cultural element to this too, as the UK has had a culture of doing things more cheaply, rather than better - unlike the Germans for instance. We have seen this in food and in housing. It's great now to see leadership saying build back better for the next generation. The way that we think about living, travel and energy is crucial, and developing the skills and technology to support these is an important part of the MK: U offer.'



Aula Medica lecture hall exterior – Solna campus of Karolinska Institutet, Stockholm

Best practice models for developing science clusters

Future Cities Forum furthered the debate on the design of science innovation parks. We wanted to ask the following questions:

- Is it better for sustainability to build technology clusters from the top down or bottom up?
- How do you create a strong identity behind the brand of the Oxford-Milton Keynes-Cambridge Arc?
- Are there new models in Europe for science cities that we can emulate in the UK?

The Chief Executive of KI Holding, Hans Moller, who runs the development of academic research-commercial collaboration and technology transfer for the world famous Karolinska Institutet in Stockholm, said politics cannot be dismissed as being an important influence in the development of science parks:

'If you have seen one science park, you have seen one science park! All these innovation districts are based on local infrastructure, local and regional conditions and depend on the political will of the host city. If you develop a green field site then you have control and you can develop largely as you want. However, if you have a situation like the one we have at Karolinska in Stockholm you are restricted, and you will need to work closely with other institutions. Then it is regeneration of a brownfield site and this is very different. Another question is can you ever build a cluster from the top down or is it always bottom up - like Silicon Valley in the USA?'

The Karolinska Institutet places great value on a dynamic interaction between the academic and commercial sectors, for mutual benefits and for society. The KI innovation system develops research ideas from both Swedish and other Nordic universities.

Climate change is very much on the agenda for 2021 with the COP26 conference this autumn. How has the UK been developing its ideas on green building and planning?

Scott Brownrigg Director and architect Ed Hayden was asked if the pandemic and climate crisis with its follow-on impact on the economy would impact on our design for science campus buildings. He said:

'We are experiencing a complete change of mindset on a low carbon future. The climate crisis has raced up the political agenda. We have legislated to make buildings carbon neutral by 2030. We have to find ways of making it happen. This is essentially made up of three things: to reduce reliance on fossil fuels, embracing the well-being agenda and then looking at the impact of the pandemic on building design. Buildings also have to respond to sit successfully with innovations in science and technology. We will see a lot more timber frame design being introduced, even within lab spaces. We will also see much better airflow and ventilation design to reduce risk of contamination. All of these things have to sit within the overall future low carbon development.'



ARM HQ, Peterhouse Technology Park, Cambridge (Scott Brownrigg)

Questions have surrounded the future of 'science cities' - those rich in R&D and science discovery - such as Oxford and Cambridge, with their traffic congestion problems and housing issues. So, has the world changed with the pandemic and is there still the need for new physical innovation hubs when scientists can connect in conversation across the world through digital platforms?



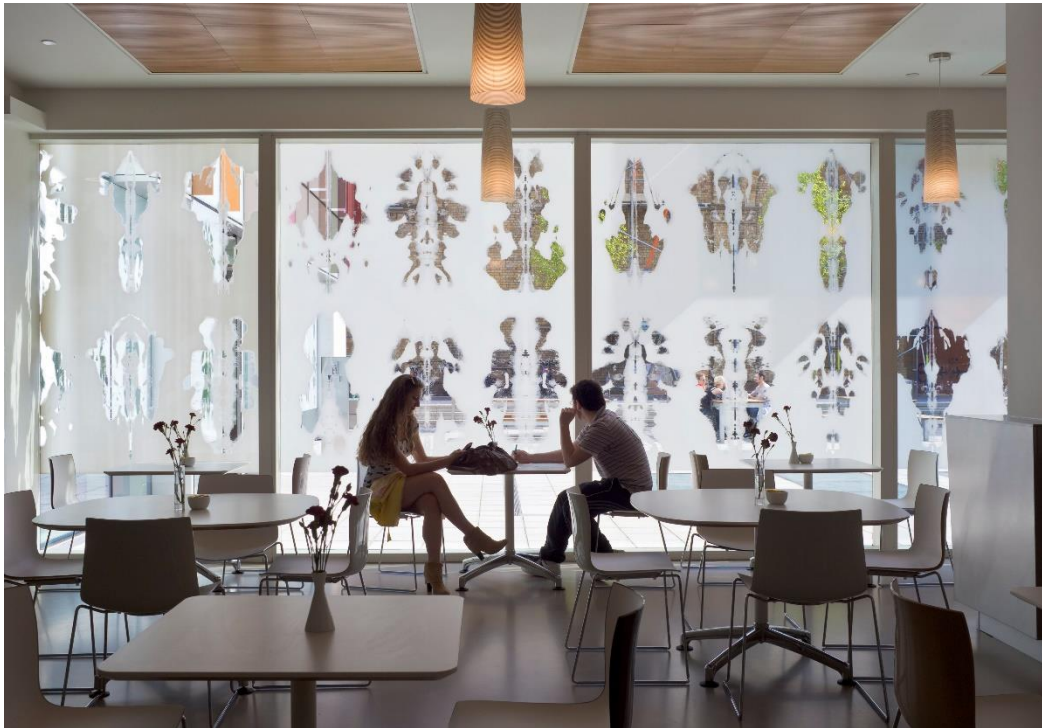
Teaching and Learning Building at Birmingham University (completed 2020 – BDP)

Keith Papa, Director at architecture and engineering practice BDP, commented that the need for physical space was not going away. 'Scientists will still need to work in labs but the question is how you draw in the wider community to innovation hubs? There still needs to be a singular vision around a science cluster' he said, 'and the work that Birmingham University has done in building 'a green heart' through landscaping has helped build a brand that has encouraged people in.'

Measuring over 12 acres, the Green Heart opens up the centre of the campus at the University of Birmingham, for students, staff and the local community to enjoy. The university says that it provides a unique space for performance, while opening up views across the whole campus as envisaged in the 1920's. It creates new pedestrian and cycle routes allowing safe travel and the project has made a sustainable, natural and environmentally friendly landscape for both people and wildlife.

Additionally, in healthcare design, BDP's new Clatterbridge Cancer Centre in Liverpool is transforming the lives of people in the city and improving the standards of cancer care in the UK. It has won 'Project of the Year' in the North West Regional Construction Awards. Importantly, since it opened in June last year, it has been attracting compliments from service-users, staff and the local community with its people-led design. The firm describes how the building is stepped back in profile at its upper levels, the terraces having spectacular panoramic views, connecting the building with the city giving staff, patients and visitors access to external landscaped areas and fresh air. A sunken

landscape courtyard at the prow of the building creates a covered winter garden providing a space that promotes recovery and wellbeing.



Café at the BioChemistry Building, Oxford University (HawkinsBrown)

Covid-19 and future design of science and university campuses

So how should university campus design change to account for scientists still needing a physical work space to go to, students' accessing libraries during Covid-19 and for community accessibility?

In the summer months when scientists were testing for a Coronavirus vaccine at Oxford University Future Cities Forum spoke to architects Hawkins\Brown, about the science buildings and laboratories that they are designing for the university.

Partner Oliver Milton heads up the education and science sector at Hawkins\Brown which has completed Oxford University's Beecroft Building for physics research and is currently working on the second stage of the university's Bio-Chemistry Building, which has become recognised according to the architectural firm, as a new model for university research buildings.

There has been much discussion in recent years about what is needed in terms of the best environments for scientists to work in collaboratively, but also the standard of facilities that will continue to attract global talent to UK universities. The UK government is currently investing heavily

in life sciences innovation and over the last week has opened up funds for science 'start-ups' in its determination to ensure that the UK remains a world leader in science discovery and commercialisation.

Oliver is a member of 'Designers for Science' a group which discusses the latest trends in science architecture. At Hawkins\Brown the practice states that 'it reverses the accepted layout that collects the laboratories in the dark centre of the building and instead puts them on the outside where they have contact with the outside world and are highly visible to the wider university community. This allows the 'write up' of teaching spaces and principal investigators offices to be collected around a busy atrium at the heart of the building.

'This interconnected way of working has increased the number of research projects the department has sponsored, increased overall funding and attracted new researchers, lecturers and students from around the world'.

The scientists themselves are in no doubt as to the value of this approach. Professor Kim Nasmyth, Head of Biochemistry, University of Oxford. stated 'this (the Biochemistry Building) is a beautiful, innovative and functional building. It allows conversations to happen that wouldn't otherwise take place in a thousand years'.

Another of Hawkins\Brown's creations, The Beecroft Building - the first new building in 50 years for the Physics Department - is also providing world-class facilities for experimental and theoretical physicists and sits on a high-profile site next to the University Parks, opposite Sir William Butterfield's grade 1 listed Keble College Chapel.

Hawkins\Brown describes the building as 'responding to the upright gothic style' of the college 'clad in a combination of bronze, glass and expanded copper mesh insert panels with a grid of naturally weathering bronze fins'. The building has received many awards, among them National Award Winner in the RIBA Awards 2019, New Building Winner for the Oxford Preservation Trust Awards 2019 and Winner - Chemistry and Physical Science Buildings for the S-Lab Awards 2019.

Meanwhile, Oliver says the focus on collaboration spaces in science buildings is now an accepted norm:

'The New Biochemistry Building at Oxford University which we embarked on over ten years' ago as the first of two halves, will create a combined 25,000 square metres of floor space. It was a game-changer in 2004 with an unusual brief which stressed chance encounters. Now it's very rare to get a brief which does not include the importance of designing spaces which encourage scientists to talk and meet informally.

'We focus on circulation in buildings and we are well aware that people don't go and sit somewhere for no reason. We therefore think hard about buildings that both enable and demand movement. The Biochemistry Building has a cafe at the entrance, which greatly helps informal interactions. Lots of clients ask for cafes on the roof but we resist those demands as we want the cafe to be the place you move through to get to somewhere else.'



The Beatrice Shilling Building at Royal Holloway University of London (by Stride Treglown)

The return to university in the autumn of 2020 led to new outbreaks of the C-virus and placed some students in lockdown. The BBC reported that some complained of being locked down in their student university halls in a situation described by student unions as shambolic.

Cora Kwiatkowski, Divisional Director at Stride Treglown says that students in 2020 faced an extraordinary burden in navigating the ongoing pandemic. But could the opening of libraries and study spaces 24/7 help maintain correct social distancing while keeping learning ongoing?

She cites the firm's design of the Beatrice Shilling Building, completed in 2018 for Royal Holloway, University of London, in Egham, Surrey, driven by demand from students with increasingly high expectations as paying consumers of education.

Future Cities Forum spoke to Cora about the practice's work on university buildings.

'Our work at Reading University (life sciences building) was shortlisted for an Education Estates Award for best refurbishment and Best Student Experience...it's good to ask what the students and staff think of the building. We run an 'Inhabitants series' where we get feedback from occupiers of our built projects. It is always very good to hear from students, as these are unfiltered views. It's our own post-occupancy survey.

'Female Asian students (at Royal Holloway University of London) said – about our Beatrice Shilling Building - that it was very good that we can make the buildings our own, with groups of us sitting on the floor with cushions.

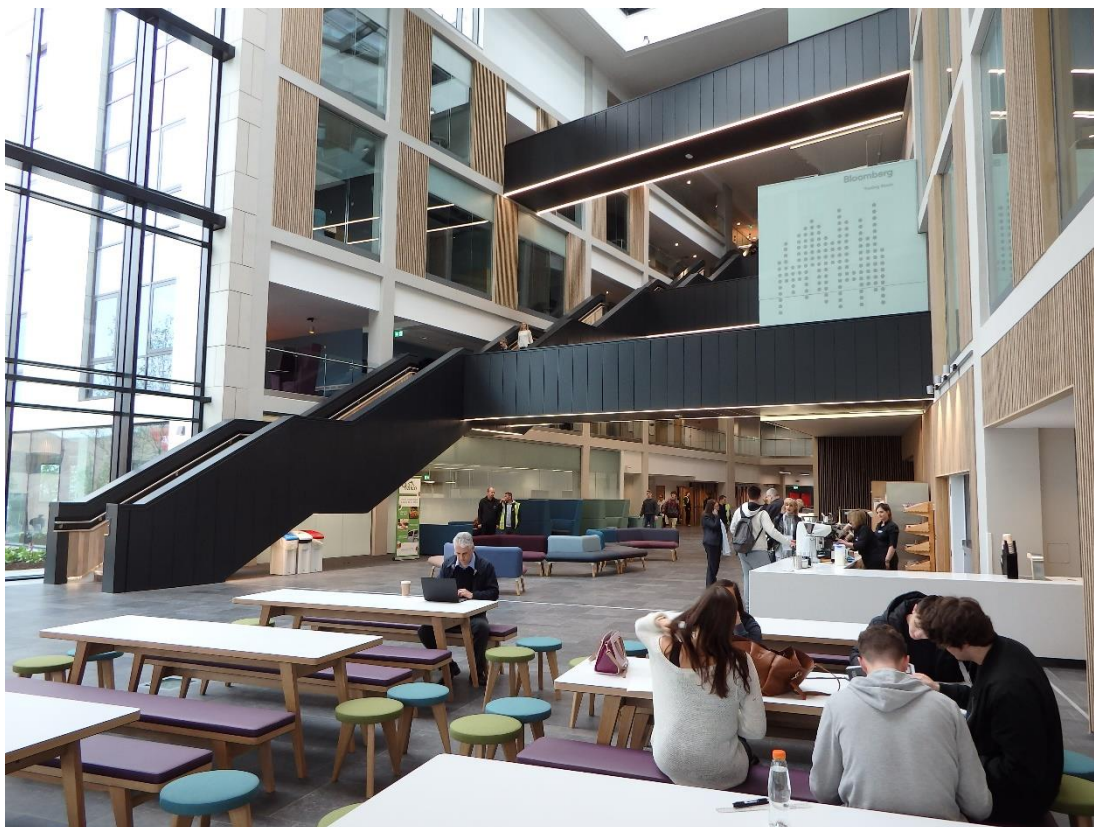
'Universities have a civic role as well. If the university is urban in situation people will move through the campus in a natural fashion. We designed the University of West of England Bristol Business

School new building and this has a café which is open to the city population and is very popular. Locals have even asked whether it can be open at the weekend, too. It helps UWE to connect local businesses to the university – and these come and use the building. Making the campus porous is definitely part of this.'

The £55m Bristol Business School project and external plaza for UWE forms the new heart of the Frenchay Campus. The 17,000sqm building and public realm connect the disjointed campus and the residential development beyond, setting the scene for future developments. This world class facility promotes a cohesive relationship between campus, industry and local community with businesses, neighbours, visitors, 5,500 students and staff having access to the large café in the airy atrium, community services and a wide range of social learning workspaces to enable collaboration and greater interaction.

Located at the new heart of the Campus, it also attracts the local community, being straddled by a Public Right of Way (PROW) that had been retained, widened and improved as part of the project. It connects the Bristol Business School with new residential areas beyond as well as public transport such as the Metrobus and Bristol Parkway Station.

Future Cities Forum is continuing with its European Science and Tech Cities discussions in 2021.



Atrium of University of West of England's Bristol Business School (Stride Treglown)



Bioscience discovery in historic park land setting with modern lab and office extensions: Babraham Institute (partner organisation of Cambridge University) and Babraham Innovation Campus (owned and managed by BioMed Realty)

Conclusions

1. 'Science cities' require joined up housing and infrastructure if they are to be sustainable. According to the I&PA, now that we are out of the EU, it is possible for the UK to achieve more clarity and simplicity in delivering infrastructure projects. The UK can for example say how it selects project contractors, but the new rules also will need a 'culture change' around them for optimum benefit.
2. Post Covid-19 the I&PA has suggested that there is now a smaller budget to cover all forms of future infrastructure such as hospitals, roads and rail but says there is no less ambition to achieve targets. Within these ambitions is the need not to ignore virtual connectivity in telecoms and digital such as 5G. In all, it is important to balance the investment from both private and public.
3. Costain has pointed up the silver lining of Covid-19 in that the project management of infrastructure has become 'more agile and decisive.' The East West connectivity is now being treated properly as a project and Alex Vaughan, CEO of Costain has welcomed the 'Construction Playbook' saying 'We are delighted that the Government and industry have come together to jointly develop this Construction Playbook. The Playbook gives us all a framework in which to operate, supporting us to deliver infrastructure in a safer, greener, faster, better and more efficient way.'
4. Station-led regeneration has remained important for the attraction of investment as with the re-development of Cambridge Station with the CB1 district and the construction of Cambridge North and with the addition of good quality housing. World-class research universities remain a vital draw.

5. The I&PA says there is still not a clear identity behind the Arc brand and leveraging in private investment into the wider Arc remains a challenge. David Lock Associates believes there is a lack of proper mapping and drawing on housing for the Arc and more thinking around planning infrastructure for future work habits i.e. last mile deliveries and being able to walk to the office.
6. The UK could do well to look at foreign models of 'science cities' such as the 'International bau-austellung' model at Heidelberg. MK:U reflects that sometimes the UK has a culture of doing things more cheaply and not necessarily better than would be done in Germany and that we have a once in a generation chance to build back better and not undermine the sustainable intentions of BREEAM excellence.
7. Successful cities need to create stability for the family not just individual workers - according to Deloitte - which allow for both spouses to move jobs without leaving the city. Schroders has collated data to show how people commute to certain buildings and research institutions and states that research shows young tech companies no longer want to place themselves on the edge of town but be in the centre of cities close to supporting organisations and facilities.
8. Drawing communities into science innovation hubs has shown to be successful through the 'Green Heart' landscaping at Birmingham University (noted BDP) which has in turn built a good brand for the university itself. Stride Treglown notes that effective library design as in its' University of the West of England Bristol Business School project, has also drawn in local people, so that the community benefits as well.
9. With concerns around climate change science buildings will be designed more with timber for sustainability and proper ventilation to avoid the risk for infection contamination according to Scott Brownrigg.
10. In 2004 it was unusual to receive a brief according to Hawkins Brown which stressed chance encounters. Now it's very rare to get a brief which does not include the importance of designing spaces which encourage scientists to talk and meet informally, creating important 'light-bulb' moments in innovation.

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