

## The University of Edinburgh's Futures Institute

RAB BENNETTS studied at Edinburgh College of Art and in 1987 co-founded Bennetts Associates, where he has pioneered sustainable, high-quality architecture. He was a founder of the UK Green Building Council and, in 2003, was awarded the OBE for services to architecture.

Above: David Bryce's 1870s watercolour depicted the hospital in a romantic, rural setting and on a flat site. Courtesy of Lothian Health Services Archive.

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**W**hen the NHS finally vacated Edinburgh's old Royal Infirmary in 2003 for a new suburban location, it left behind a Pandora's box of clapped-out buildings dating from the 18th to 20th centuries. Locked between the old town and the Meadows, it was like an entire city quarter and, with a perimeter of around a mile, the incoming developer's marketing name of "Quartermile" had a ring to it.

After some controversial demolition, Foster & Partners has filled much of the development site with a grid of architecturally uniform offices and apartments, with a small cluster of retained buildings at the centre. The addition of the University of Edinburgh's Futures Institute within the last surviving group of historic structures will add greatly to the development's diversity and activity but it will also be the catalyst for better connections with the city as a whole.

By far the most prominent architectural landmarks of the old hospital were two ranges of hospital wards – the medical and surgical hospitals – designed in the Scotch Baronial style by David Bryce and completed at an extraordinary speed between 1873 and 1876. The medical hospital was redeveloped by Fosters & Partners first as it occupied the prime residential site overlooking the Meadows.

There, the wards were converted into lofty or double-height flats, but the

umbilical corridors that connected them were removed so that new apartments could be placed in the gaps created, setting up a successful rhythm between the castle-like masonry and the glass apartments.

The category A listed surgical hospital proved more difficult, as it was Bryce's centrepiece complete with a grand main entrance and clocktower addressing Lauriston Place. Its six blocks of Nightingale wards were arranged symmetrically on either side of a daunting east-west corridor that stretched 145 metres in length, with four to the north and two to the south. Various schemes to convert the complex into more flats or a hotel founded on viability and, by the time the University purchased the empty property, it had been failing to keep the rain out for well over a decade. Its poor condition only seemed to amplify its limitless store of vivid memories.

### DESIGN STRATEGY

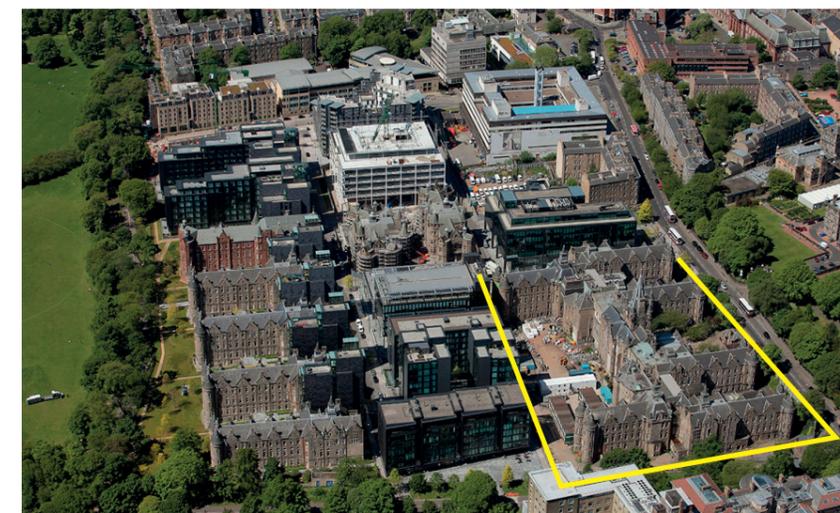
Previous experience on conservation-led projects (such as our own studio in London and the Royal Shakespeare Theatre in Stratford-upon-Avon) proved that working with existing buildings obliges the architect to innovate or to use a theatrical term 'improvise' in a way that is very unlikely with a new building. The results can surprise and delight, but improvisation also produces new ways of thinking about something as difficult to pin down as an 'institute for the future'. At

Edinburgh's former surgical hospital, three architectural principles emerged that are turning these constraints to advantage.

The first of these focuses on integration. Edinburgh University wants to create a global centre where academics from the arts, humanities and the sciences will mix with external partners from industry and government to tackle the big questions of the future. However, a former hospital with long corridors designed to prevent infection is hardly the best place to foster collaboration and serendipity, so we are transforming them by adding a ribbon of accommodation on one side and larger teaching spaces on the other. Break-out spaces, meeting pods, refreshment points, workplaces and the all-important stairs or lifts will activate the corridors, turning them into a resource that is far more than mere circulation. The isolation demanded in Bryce's time will be replaced by a contagion of ideas.

The second principle is to clear out as many of the non-original accretions as possible, including mezzanines, lowered ceilings and ad-hoc partitions, so that the 22 wards can be seen for what they once were – tall, well-proportioned rooms with good daylight and ventilation – making them suitable for most learning activities. Externally, removing the clutter at roof level and the later extensions in the courtyards has already allowed the original architectural form to reclaim its clarity.

The third principle is to interpret radically the sense of public importance envisaged by Bryce through the insertion of a new public space. Bryce's initial watercolour depicted the château-like symmetry of his composition in a flat rural setting, but reality soon set in. A later aerial drawing showed the inevitable railings around the perimeter; a gatehouse and an imposing flight of steps. By the mid-20th century, hardly anyone used the front door at all; it was an accessibility nightmare, which is why the side entrance for A&E is what people recall instead. To unlock this practical problem and create, in effect, a new identity, we are removing the gatehouse and gates to create a new public square in front of the clocktower, with ramps on either side leading to the top of the grand staircase. The square will be available for public events and graduation days, making a contribution to Edinburgh's public realm and creating a



Above: Most of Foster & Partner's blocks are complete in this view from 2015. The surgical hospital is bottom right (outlined in yellow) by Lauriston Place.



Above: A late 19th-century drawing showing the addition of perimeter railings and roof-top wind spires. Courtesy of Lothian Health Services Archive.

Below: A photograph taken during enabling works, showing the 20th-century extensions about to be removed and the surviving wind spires beyond.





Visualisation from Lauriston Place, showing the new public square, additional blocks between pairs of wards and reinstated roof spires.

breathing space on busy Lauriston Place. Moreover, thanks to the pronounced gradient, the square will form the lid to a large lecture/performance space accessed at the lower ground level. This multi-level intervention will give the design a centre of gravity that the hospital's daily use had lacked and enable the University to make a very public statement about its outward-facing role.

Seeing the old Royal Infirmary and its history as a stimulus rather than as a hindrance has been fundamental to the vision of a new Futures Institute. Which is just as well, as the re-use of existing buildings, complete with their limitations and potential awkwardness, has become pivotal to fighting climate change.

### LOW CARBON

Having designed 'green' buildings since the early 1990s, we've known for many years that the embodied emissions from construction and maintenance are at least as harmful to climate change as those accumulated from a building's lifetime operation. Partly due to our influence and research, embodied CO<sub>2</sub> has at last been incorporated into the zero carbon strategies devised by the UK Green Building Council for Government, some local councils and developers. Over the same period, our projects have sought to reduce operational emissions by challenging clients' briefs, reducing energy demand, adopting passive design techniques, and simplifying their operation.

More recently, we've been able to rely on a sizeable proportion of renewable energy as well. Therefore, having established a new purpose for the former Royal Infirmary, we are using our experience to implement a simple menu of policies that reduce embodied and operational CO<sub>2</sub> emissions alike:

Embodied carbon;

- Retaining as much as possible of the existing shell, internal structures and some surviving finishes
- Recycling existing materials where possible, particularly stone and slate
- Selectively enhancing the retained structures so they are resilient to future change
- Reducing the embodied carbon in the new construction
- Using off-site prefabrication for services and new-build glazing assemblies

Operational carbon;

- Insulating the existing walls, roof and ground floor to reduce energy demand
- Refurbishing and/or renewing windows with double glazing
- Maximising natural ventilation, including reinstatement of opening windows
- Restricting mechanical ventilation to high-density spaces only
- Connecting to the University's heating and cooling network

### PASSIVE DESIGN

Before examining how these policies will work in practice, it's worth looking once again at the two perspectives by David Bryce, as there is another important difference between his bucolic watercolour and the later aerial view. Apart from the secure perimeter, the skyline has acquired six additional spires – one for each ward block close to where it joins the central corridor. We discovered when we started stripping out the building that there was a system of narrow timber ducts within the floors that eventually rose vertically to connect with these spires, which were designed as passive ventilation chimneys. The detailing was sophisticated, as the spires had to keep rain out whilst allowing air to be drawn through by suction in this windiest of cities. Seemingly to avoid cross-contamination, there were also vertical ducts in the corners of the wards connected to small dormer vents in the conical turrets.

How effective this ingenious system was we don't know, but there must be a research thesis waiting to be written. Bryce turned passive ventilation into an architectural virtue, but who designed it and what engineering principles were available at the time? As there were also opening windows, was there a medical or climatic reason behind this separate extract system? Passive or stack-ventilation systems were quite common in Victorian times – for example, in theatres and town halls – but many of them were

blocked up in the 20th century through ignorance or because they didn't work very well.

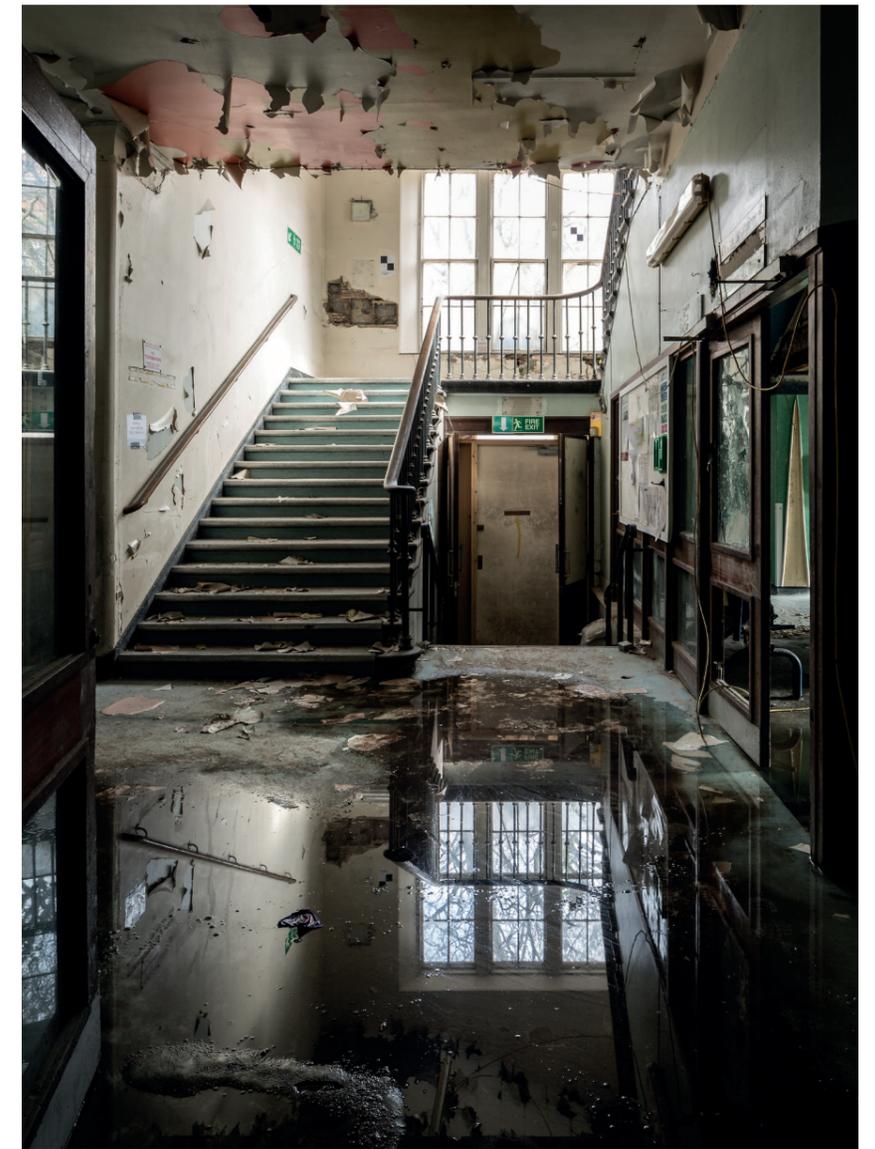
Unsurprisingly, what we found at the old Royal Infirmary was layer upon layer of additional suspended ceilings, concealing modern ducting and other services. And huge amounts of dry rot!

Old photographs confirm that the Nightingale wards were elegant spaces with regular tall windows and the services engineer's analysis shows they will ventilate naturally, without the defunct system of ducts. The inward-opening hoppers above each sash window, previously blocked off by the NHS's dropped ceilings, are sufficient for most of the learning rooms and workspaces, which means that only the new wings with higher density occupation are to be supplemented by mechanical ventilation and chilled beams. The lecture/performance space, which has a local plantroom for conventional air-handling, is also day-lit, with two glazed 'light-boxes' providing distinctive architectural forms that delineate the public square at street level.

### FINISHES, INSULATION AND SERVICES

All the external stone walls are being insulated with a breathable dry-lining system. The original ceilings will be renewed as they were missing or damaged, not least from dry rot, so the insulated line is being carried across the gently vaulted ceiling on the top floors. For the same reason, the timber floors are being replaced or strengthened in some places, with new electrical and data services contained in broad metal trays slung beneath the joists. We certainly couldn't reinstate the fireplaces in each ward, so we are installing warm-water radiators under the windows.

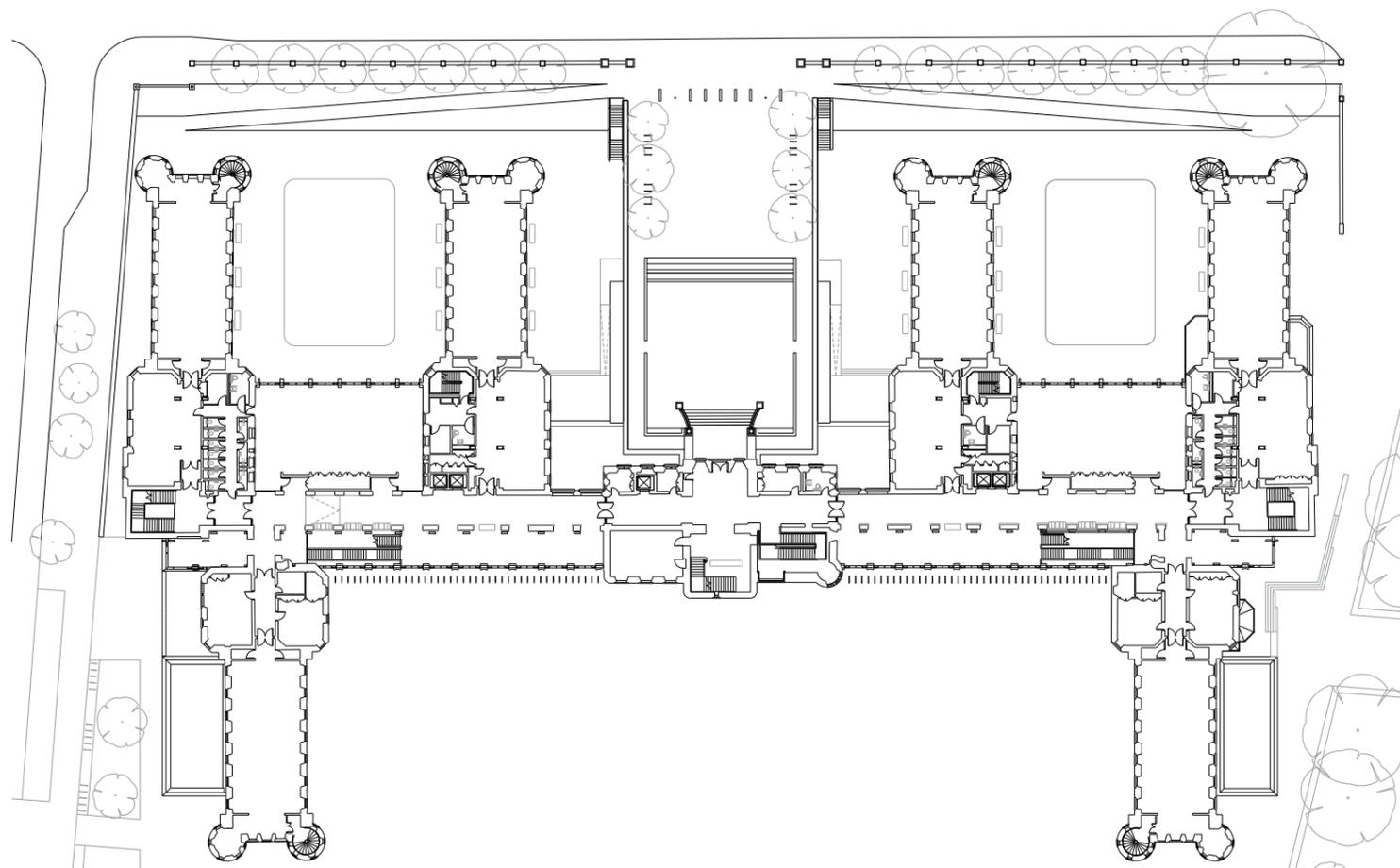
As the central corridors are to be internal, and don't need thermal insulation, much of the stonework is being exposed to view where the lath and plaster was affected by dry rot. However, we have been able to rescue some of the painted donor boards that record individual gifts from Queen Victoria and many private individuals. Among a number of surprises, we were thrilled to discover huge slate paving flags in the corridors, once the lino and other 'hygienic' finishes had been



Above: The building was in a dangerous condition after more than a decade of water penetration, as shown here in a mid-level hallway. © Keith Hunter

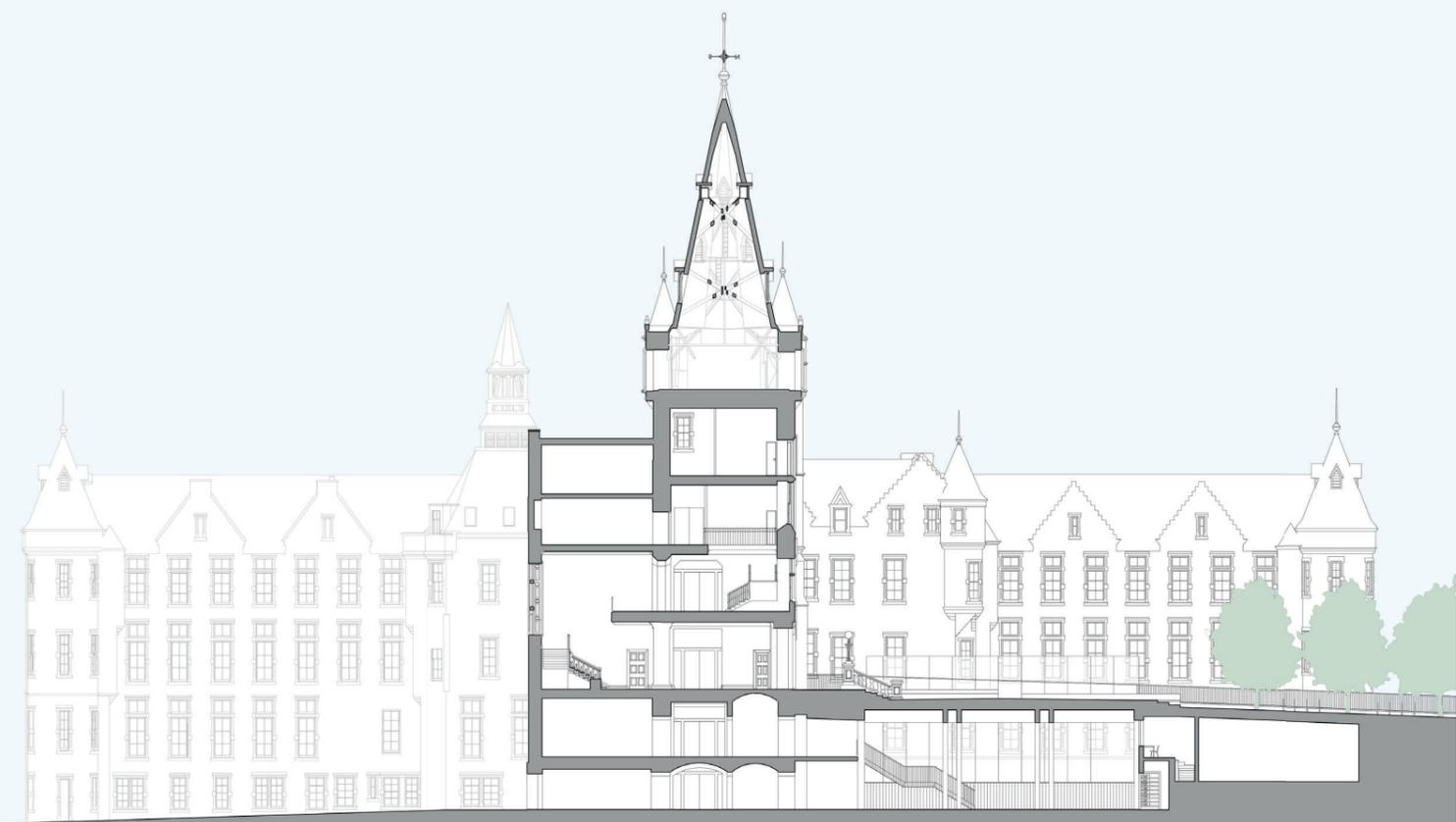
Below: A typical ward, photographed c.1917, showing the spacious layout of beds between tall windows, with lower sashes and upper inward-opening hoppers. © Courtesy of HES





Level 2 Plan (main entrance from Lauriston Square).

Section through the new public square, event space and clock tower.



peeled off. These too will be exposed to view after their vaulted brick supports have been repaired.

With toilets, lifts and IT rooms clustered in the wider ends of the wards next to the corridors, vent pipes and small ducts are grouped together in risers that terminate in the former wind spires, so there is more than a hint of their original function.

Main services are connected to the University's George Square heating and cooling network, which was installed around 12 years ago to serve its city centre campus buildings. As a result, the gas-fired facility ensures that the Futures Institute will be inherently lower carbon than a stand-alone facility. Looking to the future, we know from our large projects elsewhere that the increasing amounts of renewable energy that are becoming available can be combined with retention of an existing building to reduce carbon emissions to near zero, with offsetting closing the gap that remains. This didn't seem possible just a couple of years ago, but it is now clearer than ever that the re-use of existing buildings is critical to combating climate change.

### COMPLETION

Having won the competition in 2015, turning one of Edinburgh's best-loved public buildings into the Edinburgh Futures Institute is requiring stamina as well as foresight. Quite apart from the inevitable time taken with planning negotiations, a main contractor couldn't be procured until 'enabling' contracts for asbestos removal, dry rot eradication and demolitions had first de-risked the construction. Starting in 2019, the lengthy duration of the main works was dictated by the availability of traditional stone and slate trades for the restoration process, but due to the coronavirus shutdown, occupation may now be delayed until 2022/23.

This is a substantial investment for the long term, however, and working with the former Royal Infirmary's underlying qualities to make it intrinsically sustainable and far more adaptable to future change should ensure that it takes a central role in the University for another century at least. It is this kind of timetable that puts the quest for zero carbon into perspective. ■



A visualisation of a typical corridor, with lath and plaster removed, enlivened by meeting spaces and refreshment points. The original slate paving flags were found under many layers of lino and other finishes.



The multi-purpose event space below the square, with the 'light-boxes' on either side. Below, right: A new public walkway will be created inside the railings to Lauriston Place.

### PROJECT TEAM

*Project manager and lead consultant:*  
Faithful+Gould

*Architect and conservation architect:*  
Bennetts Associates with Consarc  
*Services engineer:* Atkins

*Structural engineer:* Will Rudd Davidson

*Quantity surveyor:* Thomson Bethune

*Enabling works contractor:*  
Sir Robert McAlpine

*Main contractor:* Balfour Beatty

For more information and the latest news about this project, visit:  
[www.bennettsassociates.com](http://www.bennettsassociates.com)

