



ARCHITECTURE IS INTERFACE

LATENT VIRTUALITY FROM ANTIQUITY TO ZOOM



Xin Chen, Min-Young Jeong
and Denise Jiang,
Soane House - Our House,
'Low-Relief' Advanced Synthesis
Option Studio,
Carnegie Mellon University,
Pittsburgh, Pennsylvania,
2020

In response to pandemic isolation, the project explored the spatial continuum of the students' physical rooms, the digital spaces of their daily collaboration, and the additional spatial presence of their collections and models of architecture, both physical and digital. This student team's design highlights a heightened awareness of private and public spaces where the computer camera's cone of vision demarcates this hybrid reality.

Architectural educators
Joshua Bard and
Francesca Torello
embrace numerous digital
technologies to subvert
issues of scale, framing,
materiality, inside and
outside to provoke viewers
into contemplating
the current nature of
architecture and its
discourse. Their inspiration
is Sir John Soane's Museum
in London, which is a
multilayered conversation
between objects and their
interrelationships with
themselves and
their settings.

... the virtual, strictly defined, has little relationship to that which is false, illusory, or imaginary. The virtual is by no means the opposite of the real. On the contrary, it is a fecund and powerful mode of being that expands the process of creation, opens up the future, injects a core of meaning beneath the platitude of immediate physical presence.

— Pierre Lévy, *Becoming Virtual: Reality in the Digital Age*, 1998¹

In March of 2020, at the onset of the Covid-19 pandemic, we found ourselves scrambling to adjust our jointly taught architecture studio at Carnegie Mellon University to remote teaching. Like other educators around the globe we quickly cobbled together a multi-platform, online infrastructure to facilitate remote learning. What was different for us, however, was our studio's focus on architecture and virtual reality.

For the past six years we have been collaboratively working and teaching at the intersection of our shared interests: as an architectural historian exploring buildings' mediatic power and as a design educator focused on the historical roots of contemporary technology. While virtual reality (VR) and augmented reality (AR) technologies are often pitched against bricks-and-mortar architecture or described as 'a possible distraction from the real world',² a sophisticated culture of hybrid, physical and virtual spaces consistently runs through architecture's history, well before the digital. Hybrid spaces are actually a core strength of architecture's disciplinary past.

The contention that because of this past history architects have something meaningful to contribute when it comes to contemporary AR technologies became an active experiment in response to the studio's remote modality. Conducting an architecture studio via Zoom quickly transitioned from a logistical challenge to a spatial exploration. The final assignment was reframed to respond to our new life conditions: the demarcations between public and private space were being carefully renegotiated through our cameras' cones of view and virtual backgrounds, while our screens provided both the essential connection of our worlds to each other and an escape route to other realities. It seemed obvious to explore that continuum, those portals and wormholes, the interconnected physical-visual-virtual spaces we were all floating in.

Sir John Soane's house/office/museum, with its illusionistic, multimedia apparatuses, offered the starting point for reimagining the de facto multispace confronting us. In the project 'Soane House – Our House' (undertaken within the 'Low Relief' Advanced Synthesis Option Studio at Carnegie Mellon University in 2020), the disparate physical and digital dimensions of the students' collaborative work were explored as composite architectural spaces, showing the students' forthright adjustment to designing with the connections and spill-outs between physical and virtual.

The forced modalities of life in a pandemic allowed us to more clearly recognise a hybridisation process, which from well before the emergency we had anticipated as a relevant and consequential site of architectural research.

Sir John Soane,
The Dome Area,
Sir John Soane's Museum,
London,
1837

Sir John Soane's Museum provides a prototypical analogue multispace, where architecture, media, and artefacts create a complex, multilayered experience.



Interfaces: Mediating Human Experience

Architecture can be described as an interface, mediating the hybrid strata of reality – physical to virtual, imagined and real. Buildings are many-layered, complex entities that at times create portals to illusionistic spaces, transporting us and expanding our awareness beyond the empirical scope of everyday life. Like other interfaces, architecture operates in the background, shaping the underlying structures for human activity.

The 'latent virtuality' of pre-digital architecture was obtained with precise shaping of physical materials across multiple media, resulting in complex spatial relationships and combining towards synthetic experiential ends. Decorative motifs seamlessly transitioned from columns to mouldings, from sculptures to frescos, spanning multiple dimensions of human perception, from 3D (architectural elements) to 2.5D (low-relief sculpture), 2D (flat surface treatments) and, where direct sunlight was present, time.

This savoir-faire, traditions and practices – and at times even crafts and materials – were suppressed from the discipline of architecture under the weight of the Modernist dogma against illusion and in favour of a certain kind of authenticity. They are only recently being rediscovered, in part because of their role in anticipating some of the workings of contemporary technologies, as illustrated by the following discussion of three techniques of virtualisation in architecture.

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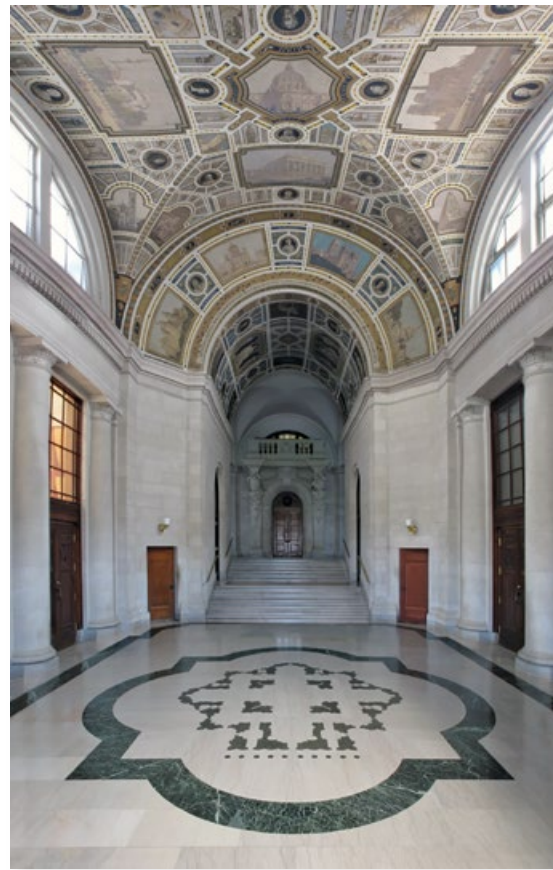
Framing: Organising Layers of Reality

Frames, one of the building blocks of architecture, demarcate transitions between spaces, create focal points for our attention, and organise our visual field.³ Frames condition lived experience, but can also encourage a probing of the boundaries of the real and the possible. Careful calibration between frame and content can create depth where there is none, or flatten spaces receding in the distance. The multiplicity and interlocking of frames provides a rich perceptual field, where from a single vantage point observers can experience at once near and far, real and imagined spaces.

In our own work environment, the early 20th-century Pittsburgh campus of the Carnegie Institute of Technology, today Carnegie Mellon University, compelling examples of framing enhance the sheer theatricality of the design of landscape, exterior and interior spaces of the Beaux-Arts campus. The apparently conventional masterplan, with its academic buildings clustered around open lawns, actually required a complicated application of sectional design and the use of trompe l'oeil to circumvent the difficult topography of Pittsburgh. Highly visible framing devices help create a visual tension between the centres of art and industry, placed as focal points at the far edges of the campus in sustained conversation with each other.⁴

The same main axis continues inside the College of Fine Arts building, traversing the multiple interlocking frames of the entry sequence within its Great Hall – completed to Henry Hornbostel's designs in 1915 – and focusing the visitor's gaze on the office of the Dean, where the monumental plaster cast of a Baroque entrance portal is deceptively used as an interior door frame.

The student installation *Magic Box* (2019) activated these design elements of the Great Hall by carefully inserting a frame that uses projection mapping of drone footage and anamorphic projection to unlock the sequential spatial logic of the campus's primary axis from a single vantage point.



Henry Hornbostel,
Great Hall,
College of Fine Arts,
Carnegie Mellon University,
Pittsburgh, Pennsylvania,
1915

The Great Hall's entry sequence deploys interlocking frames to emphasise the positioning of the building's main entrance on the organising axis of the campus plan, then drives the eye to the plaster cast portal framing the entrance to the Dean's office, placed a few steps above the main space of the Hall and at the visitor's eye level.



Keon Ho Lee, Michael Powell
and Dingkun Wang,
Magic Box, in the Great Hall,
'Low-Relief' Advanced
Synthesis Option Studio,
Carnegie Mellon University,
Pittsburgh, Pennsylvania,
2019

Students explored aerial surveillance, anamorphic projection and projection mapping in conversation with similar techniques used at the turn of the 20th century by the building's architect, Henry Hornbostel. Drone footage captured along the campus's primary axis was projected onto a plaster model in the Great Hall, further accentuating Hornbostel's deliberate blurring of interior and exterior spaces throughout the campus design.

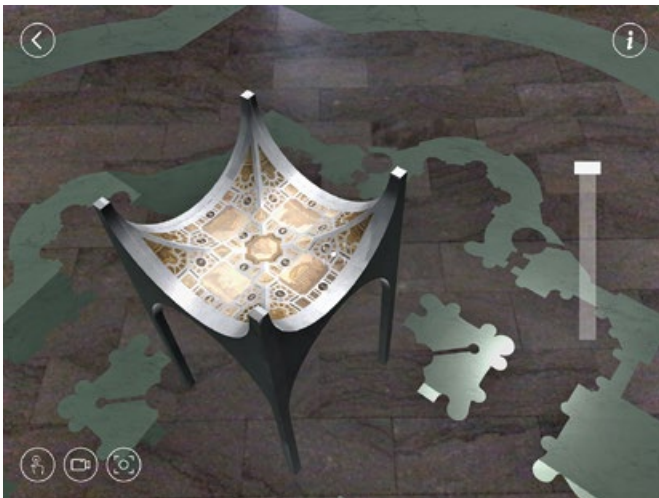


Henry Hornbostel,
Great Hall,
College of Fine Arts,
Carnegie Mellon University,
Pittsburgh, Pennsylvania,
1915

above: A substitute to educational travel experiences and inspired by the architect's own European tour, the ceiling painting by James Monroe Hewlett includes an extensive collection of architectural references. The larger images seem to carry the visitor away to lively locales, while smaller vignettes of other buildings of importance and architectural details and fragments dotted along the ornamental bands add to the pedagogical value, which at the time was based on the repetition of the canon.

Francesca Torello and Joshua Bard,
Virtual Fresco mixed-reality app,
College of Fine Arts,
Carnegie Mellon University,
Pittsburgh, Pennsylvania,
2022

below: Conceived to help visitors of the College of Fine Arts explore the painted vault of the Great Hall through augmented reality, the project is based on the premise that the ceiling itself was already designed to transport the viewer to faraway sites and buildings – just not yet with digital tools.



Perspective: the Spatial Scaffold of Perception

The design of the Great Hall reveals other exciting lessons, this time about projection and its ability to organise the built environment – a second technique that pervades the history of the discipline⁵ and which, because of its synthetic capacity, is also a key driver of architecture's relationship to the virtual.

Image capture and projection help conjure up an immaterial geometric scaffold, which can be generative for the design of buildings or work as a mechanism for shaping our perceptual experience in the built environment. The fundamental components of perspective – such as projection lines, vantage points and view cones – encourage our creative capacity to extend to imagined space the shapes and spatial relationships that architecture is only partially hinting at in physical form.

The large mural on the Great Hall's vaulted ceiling, which was added shortly after the building's construction, is an elegantly arranged collection of precedents from architecture and sculpture, mapped to the features of the vault and interspersed with references to music, painting and the literary arts. The architectural scenes were created by projecting and tracing lantern slides, the same ones available in the Carnegie Tech teaching collection.⁶ In a reverse visual effect, the content of the mural, floating high above, seems to stream back to the viewer's eyes at ground level. From a central location on the floor of the hall, viewers are enveloped in a refracted array of images closely aligned with their vantage point.

The Great Hall was designed to function as a (pre-digital) immersive pedagogical experience. In our AR project Virtual Fresco (2022), the many educational features of the space, designed to work in the mind of an early 20th-century architecture student, were used to create a digital media experience that reproduces and clarifies their functioning for a contemporary visitor. Virtual Fresco allows at the same time an enriched, immersive experience of the space, a deeper appreciation for its layered design and a clear understanding of its proto-virtual capabilities.

Gallery display,
east wall,
Hall of Architecture,
Carnegie Museum of Art,
Pittsburgh, Pennsylvania,
1907

A number of monumental, standalone pieces, a selection from the more than 150 fragments in this collection, illustrate how the uniformity of plaster allows comparison of architectural elements that vary in style, era and geographic origin, while at the same time each piece faithfully represents the different materiality of the original – smooth marble, rough and ageing stone, and even wood and bronze.

Materiality: the Hyper Reality of Faux Finishes

Buildings are materially intensive, and this constraint is often pitted against the rising tide of virtualisation.⁷ The assumption is that physical buildings are ‘real’ and virtual environments are ‘fake’. Yet a historical framing of ‘faux’, pre-digital materials in architecture uncovers a number of parallels that complicate this seemingly antagonistic binary.

Plaster is an especially fitting example of a ‘real’ material that in the characteristics and possibilities of its seemingly ‘faux’ applications works as a pre-digital, analogue counterpart of the surface treatments we see applied in digital space. Plaster is the ideal faux material; it is a highly plastic, monochromatic substrate, applied seamlessly across architectural elements – from wall to moulding to ceiling; it can also be finished with hyper specificity of surface texture and colour. The combination of these traits is an embodied contradiction. Plaster is a non-material, yet it can become every material. The ‘fakeness’ of plaster is not the absence of concrete materiality, but instead the oversaturation of a too-perfect realism.



At the turn of the 20th century, plaster was an ideal material to obtain high-fidelity replicas, an important vehicle of mass-instruction in an era of still relatively expensive and hard-to-find photographs and limited travel opportunities. It was common for schools to have collections of smaller fragments for pedagogical purposes,⁸ while museums housed large and monumental plaster cast collections.⁹ One of the few cast collections of architecture that still survive today is the Hall of Architecture at the Carnegie Museum of Art in Pittsburgh (1907).

In the museum's gallery, forms from disparate geographic regions and time periods are made orderly and comparable by being uniformly cast in plaster, yet the same material also adapts to show different surface treatments and levels of ageing, connecting each replica in the museum with its original elsewhere in the world. The hyper-real materiality and three-dimensionality of the plaster pieces were necessary cues that the viewer needed to be able to conjure up the original building, just as credible material effects give substance to the immersive environments that we traverse and experience in the digital realm today.

In fact, the Hall provides a 'virtual tour' within its walls. In this regard, historical collections of plaster casts of architecture are a precedent of contemporary virtual reality. Just like AR experiences, they collapse space and time, encouraging unexpected juxtapositions and the ability to curate and organise fragments to form new structures of understanding.

Our AR project Plaster ReCast (2018) was designed to make the layered, complex workings of this collection legible to contemporary visitors by using digital media.¹⁰ The fragments in the museum are also aliases, which represent the entry point into the larger, virtual and three-dimensional space that the visitor can explore and learn about.

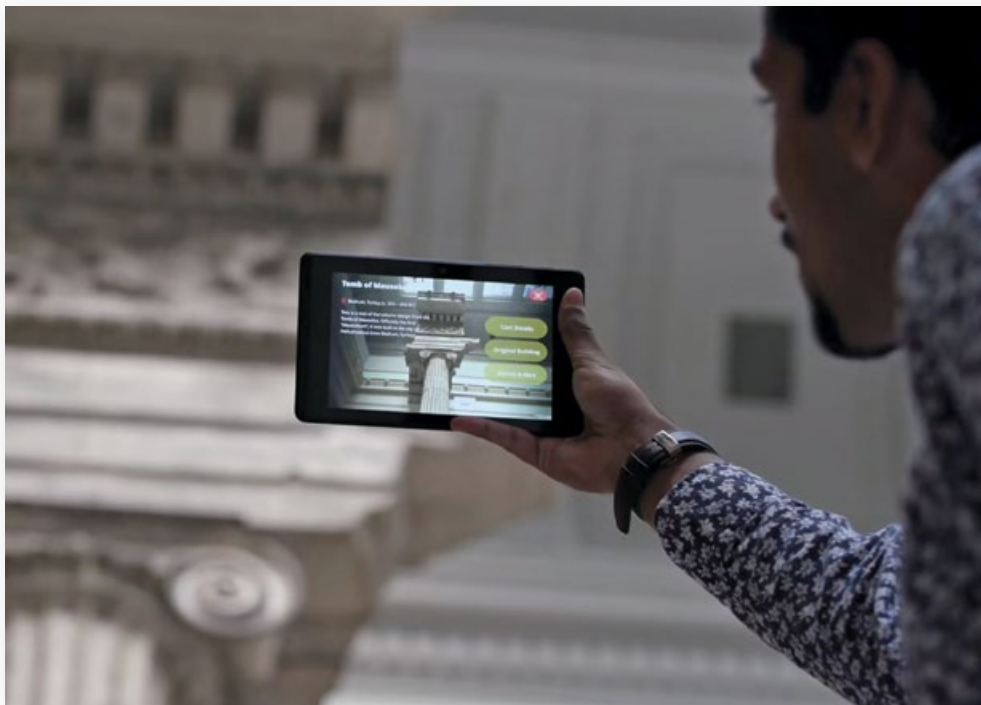
Synthetic Spaces

The techniques of virtualisation in architecture are rarely found in isolation and are more often deployed in combination, to heightened effect. The techniques, precedent and projects discussed in this article illustrate how architecture has long probed multiple dimensions of reality and serves as a connecting bridge between physical and virtual experience.

To uncover architecture's latent virtuality suggests a continuation of concern and technique in architectural design that is ideally situated to inform contemporary practice and its relation with technology. Framing architecture as a reality interface foregrounds the task ahead: as immersive technologies become more interactive, and the built environment more adaptive, designers have a real opportunity to shape the synthetic spaces of the future. ▢

Notes

1. Pierre Lévy, *Becoming Virtual: Reality in the Digital Age*, Plenum Trade (New York), 1998, p 16.
2. Pamela Buxton, 'Opportunities: The Metaverse', *The RIBA Journal*, 12 April 2022: <https://www.ribaj.com/intelligence/the-metaverse-a-virtual-opportunity-or-a-distraction-from-real-world-work>.
3. See Bernard Cache, *Earth Moves: The Furnishing of Territories*, MIT Press (Cambridge, MA), 1998.
4. See Martin Aurand, *The Spectator and the Topographical City*, University of Pittsburgh Press (Pittsburgh, PA), 2006, pp 136–201.
5. See Robin Evans, *The Projective Cast: Architecture and its Three Geometries*, MIT Press (Cambridge, MA), 1995.
6. See Charles Rosenblum, *The Architecture of Henry Hornbostel: Progressive and Traditional Design in the American Beaux-Arts Movement*, PhD thesis, University of Virginia, 2009. On the Great Hall's pedagogical function, see Francesca Torello, 'History to Look At: Mediating Architectural History in Turn of the Twentieth Century Pittsburgh', in Salvador Guerrero and Joaquín Medina Warmburg (eds), *Lo Construido y lo Pensado – Built and Thought: European and Transatlantic Correspondences in the Historiography of Architecture*, Asociación de Historiadores de la Arquitectura y el Urbanismo (Madrid), 2022, pp 566–80.
7. See Antoine Picon, *The Materiality of Architecture*, University of Minnesota Press (Minneapolis, MN), 2020.
8. See Mark Wigley, 'Prosthetic Theory: The Disciplining of Architecture', *Assemblage*, 15, August 1991, pp 7–29, and Katherine Wheeler, 'A Tangible Past: Casts in British Architectural Education', *ARRIS: The Journal of the Southeast Chapter of the Society of Architectural Historians*, 23, 2012, pp 2–15.
9. See Mari Lending, *Plaster Monuments: Architecture and the Power of Reproduction*, Princeton University Press (Princeton, NJ), 2017.
10. The app was developed by the authors in collaboration with the Carnegie Mellon Entertainment Center and Carnegie Museum of Art: see <https://vimeo.com/246512552>.



Francesca Torello and Joshua Bard with the Carnegie Mellon University Entertainment Technology Center and Carnegie Museum of Art, *Plaster ReCast mixed-reality app*, Pittsburgh, Pennsylvania, 2018

Plaster ReCast is based on the interplay between the virtual and physical dimensions of cast collections – the required mental effort of imagining the original building, which cannot be present in the gallery space; its didactic connections to history, geography and archaeology; and the physical experience of observing highly crafted artefacts in spatial juxtaposition to each other.

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