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Virgin and Child. Wood (oak) with polychromy and gilding, h. 83.5 cm. Mosan, Liège(?), late thirteenth century. The Cleveland Museum of Art, John L. Severance Fund 2014.392. Photo by Cleveland Museum of Art.

falls in fluid and balanced folds at her feet. The carving is of the highest standard and the figure is an example of the finest Mosan sculpture of the thirteenth century.

Like all wood sculpture of the thirteenth century and earlier, this Virgin and Child does not survive in perfect condition. The head of the child and the Virgin's right hand were once dowelled into place. These are now lost. There are also obvious losses of gilding and the original cabochons. None of these losses are unexpected for an 800 year old sculpture in wood, nor do they severely impact the aesthetic appeal or the visual integrity of this sculpture. Indeed she seems to be one of the finest such sculptures extant.

The sculpture comes from the collection of Gustav Rau of Stuttgart, who acquired it in the 1960s. Works of Mosan art in any medium are almost unheard of on today's market. This acquisition is therefore a rare addition that fills a major gap in the medieval holdings at the Cleveland Museum of Art. Together, both sculptures now provide greater depth and balance to this segment of the medieval collection. Both sculptures deserve to be more widely known among the scholarly community.

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Teaching Medieval Architecture in the Information Age

As a graduate student in the Department of Art and Archeology at Columbia University in the early 2000s, with an appointment in the Media Center for Art History, and with Stephen Murray as mentor, the world of digital humanities could not have been more exciting. I had the good fortune to have been engaged in a host of projects, from the Amiens Cathedral Trilogy animation and CD-ROM to the less well-known but equally compelling NEH-funded *Real Virtual/History of Architecture* project (http://www.mcah.columbia.edu/ha), for which we created a series of spherical panoramic photographs of a wide range of key buildings—a collection that would eventually be shared in part with ArtStor. It was an excellent education in the promises and perils of technology applied to the humanities: thanks to Murray's vision, the distinction between *digitized* humanities and *digital* humanities remained eminently crisp.

The world of digital humanities has changed much in the intervening years—so much so that it seems time to drop the technological qualifier from the couplet. Teaching art—and particularly architectural—history *without* the contribution of new media is hardly conceivable today. From the explosion of high quality online image databases—the entire Book of Kells can now be consulted in nearly all of its glory (http://digitalcollections.tcd.ie/home)—to the rapid advances in technology that have opened new means of representation to subjects that have traditionally resisted imaging, the chances to lessen conversion loss when bringing art and architecture into the classroom have never been greater.

In what follows, I will focus on architecture: because it is multi-dimensional and spatial, it presents special challenges when collapsed into two dimensions. We might begin by naming the space that lies between real and virtual, this gap that initially would seem to be the primary impediment in the successful translation of building to classroom. There is no question that a faded Kodachrome slide of the interior of still-blackened Chartres Cathedral leaves much to be desired, and will do little to engage the imagination of the student immersed in a culture of rich and fluid media. And yet, we must also acknowledge, as Nicholas Adams has done recently, that there is a productive engagement of the imagination in the real-virtual gap.[1] A near-perfect architectural simula-

[1] Nicholas Adams, "Opening Technology's Door: Perils and Possibilities," *Architectural Research Quarterly* 15, no. 1 (2011): 25-34.

crum—if such a thing were even possible—would run the risk of trivializing actual experience, of deadening the multi-sensory wonder of architecture through somatic passivity.

The following techniques of virtualization make no attempt—do not even aspire—to replace the building; each is comfortable with its fundamental experiential incompetence. Yet, each moves us just a bit closer than had been possible using the once-conventional binary slideshow, while still respecting the creative tension of the gap between real and virtual, the rewarding mental effort required to synthesize what is lost in translation. They are arranged in order of decreasing "gap," from the conventional architectural photograph to the three-dimensional computer reconstruction.

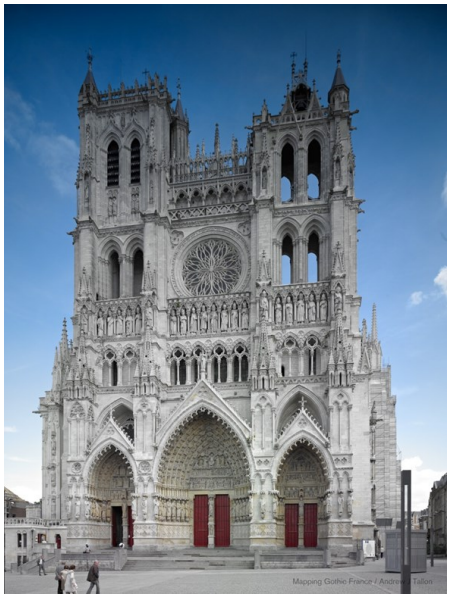

Figure 1. Amiens Cathedral, façade. Photo by Andrew Tallon, 2008. http://mappinggothic.org/image/30086?view=zoom&mode=sea.

Architectural photographs are not new; what *is* new, however, is our ability to deploy them effectively on the internet and in the classroom. High resolution rectified images such as those on the Mellon-funded *Mapping Gothic* website (Figure 1) can be zoomed into and displaced; with such an image of a facade, not only can details be recovered that were not easy to spot, but the entirety of the architectural and sculptural program can be explored without recourse to details—the context is never lost.

In a similar way, so-called gigapixel photography lends itself well to capturing monumental sculpture. The tympanum of the abbey church of Sainte-Foi in Conques, for example, photographed in 2011 as part of the *Mapping Gothic* project (Figure 2), makes it possible to bring the sculpture into the classroom with uncommon detail and precision. The image is nearly 12 gigabytes, composed of 560 images acquired with a robotic camera mount and then stitched together, but it is deployed progressively, as needed, so that only a small fraction of the image is present at one time in the browser window.

Figure 2. Photographing the tympanum at Sainte-Foi in Conques. Photo by Sofia Gans, 2011. http://faculty.vassar.edu/antallon/zoomify/Conques_Tympanum.html.

We are currently at the receding edge of the most recent vogue for stereoscopic imaging, brought on in large part by James Cameron's 2009 film *Avatar*. Three-dimensional televisions were proposed as the promise of the future a few years ago, but people realized, I suspect, that they long had been synthesizing the missing third dimension, *sans* goggles, in conventional films, and that they had not missed out on much in the process. There is something to be said nonetheless for attempting to recover stereo vision when dealing with architecture, because a true sense of space is impossible without it.

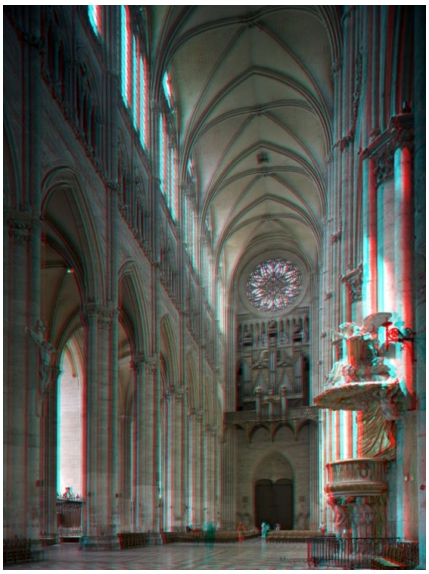

Figure 3. Anaglyph stereo photograph of the nave of Amiens Cathedral. Photo by Andrew Tallon, 2009. http://mappinggothic.org/image/35061?view=zoom&mode=naked.

The stereoscopic images on the *Mapping Gothic* website (Figure 3) are presented as red-cyan anaglyphs because the paper and film glasses required to view them are widely available.

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More sophisticated stereoscopic viewing systems do a better job of rendering color and light but require either special screens paired with goggles or head-mounted displays, which make their use in the classroom impractical.

Perhaps the most successful approach to architectural virtualization, in terms of ease of use and production, is spherical panoramic photography, which has been around for several decades but has enjoyed a renewed life thanks to the ease with which such photographs can be presented in the classroom and given to students for use out of class. A spherical photograph is composed of a number of smaller photographs made with a special bracket and then stitched together; the viewer is placed at the center of the sphere and looks out through a virtual window (Figure 4); the sphere can then be displaced "around" the viewer's head.

Figure 4. Simulation of the virtual viewing window in a spherical photograph of the Corona at Canterbury Cathedral. Photo by Andrew Tallon, 2014. http://faculty.vassar.edu/antallon/vr/canterbury/Canterbury_Cathedral_14_interior_Corona.html.

Some additional examples of spherical photographs, integrated into multi-level plans of the cathedrals of Chartres and Paris, can be seen here:

- http://faculty.vassar.edu/antallon/chartres/vr/chartres.html
- http://faculty.vassar.edu/antallon/ndp/vr/ndp.html

A related imaging technology, in which the virtual camera looks on from the exterior rather than from the interior, is better suited for objects. An early thirteenth century enthroned Virgin with Child from the collection of the Loeb Art Center at Vassar College (http://faculty.vassar.edu/antallon/vrobject/fllac/LoebMadonna.html) is an example. The technique can also be used for architectural models. Figure 5 presents a 3D reconstruction of the cathedral of Notre-Dame of Paris from my recent book with Dany Sandron (Paris: Parigramme, 2013); when converted into a web object, it can be rotated and viewed from nearly any angle.

Figure 5. Recreation of the state of Notre-Dame in Paris, ca. 1245. From Dany Sandron and Andrew Tallon, Notre-Dame de Paris (Paris: Parigramme, 2013). http://faculty.vassar.edu/antallon/vrobject/ndp_1245/1245.html.

It is equally possible to take such a model and place it in a gaming environment, such as Unity 3D, to allow students to move through it. Such attempts must be carefully contextualized, however—it has to be made clear that this is not an attempt to supplant the actual building but rather to recover something lost through modification. And every attempt should be made to adhere to a human viewpoint: it should not be possible to leap and fly, for example, as much as a close look at a (virtual) high capital might be tempting.

The perpetual cycle of innovation will bring new technologies of virtualization: a recent arrival is spherical video, in which a student could displace a virtual sphere like that of standard spherical photography, but while moving along a scripted path filmed in a real building. It is computationally demanding and somewhat expensive to produce, but these impediments will soon disappear. Imagine the excitement of combining movement with a fully spherical viewpoint! Yet such excitement must be tempered as we remember to "mind the gap"—to make sure that the technological cart has not been set before the pedagogical horse.

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