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Change over Time: Neatline and the Study of Architectural History

Cover Page Footnote

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Change over Time: Neatline and the Study of Architectural History

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Abstract

This article discusses how the usual study of architecture from the perspective of a single moment in time, usually the moment of its creation is limiting. New methodologies make it possible to add to the current rich variety of approaches available to the architectural historian in order to consider the dynamic history of the forms we study. This problem can be resolved in part through the use of digital tools, in particular Neatline, (www.neatline.org) which allows the viewer to see and understand how a building changes over time.

Résumé

Cet article traite des limites des approches traditionnelles de l'architecture, en particulier celles qui se cantonnent à un moment historique singulier, en général l'époque de création du bâtiment. De nouvelles méthodes numériques enrichissent les possibilités de l'historien de l'architecture, notamment celles qui permettent de considérer l'histoire des formes de manière dynamique. *Neatline* (www.neatline.org), que présente cet article, permet de visualiser et de comprendre comment un bâtiment change au cours du temps.

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Architecture is usually studied from the perspective of a single moment in time, typically the moment when the building is completed and brand new. This approach reflects the modern interest in design as something complete reflecting a creative process working with a *tabula rasa* and in a specific moment of time usually as the product of an individual architect. For much of history, this model is inappropriate given that the patron, rather than the architect, is the major figure associated with architecture and that buildings often evolve over centuries. Even today, most design projects are in the form of renovations or additions to existing projects although this aspect of contemporary architecture is rarely discussed. New methodologies make it possible to add to the current rich variety of approaches available to the architectural historian in order to consider the dynamic history of the forms we study. These include the use of digital tools. This article discusses one in particular Neatline, (www.neatline.org) which allows the viewer to see and understand how a building changes over time. Neatline is a tool that allows the user to assemble maps, images, texts and models that can be connected to highly specific timelines. It is not so much a tool for conducting analysis as one that allows the creation of a time-related exhibition that highlights change over a chronological period ranging from minutes to centuries.

Architecture as Sedimentation

The subjects of architectural history; individual monuments, urban plans and landscapes, perhaps more than other art forms, change, often dramatically, over time. Architecture of all scales is neither stable nor confined to one period. Even at the moment of its creation a monument may be invoking a complex series of historical associations through the selection of its site, for instance, as seen in well-known examples such as the Dome of the Rock. This structure's location has a long history of sacred associations. The rock over which the dome is located is believed by Jews,

Muslims, and Christians to be the one where Abraham's sacrifice of Isaac took place as well as the location of both Solomon and Herod's temples and the Holy of Holies. On a larger scale, the urban fabric of Aleppo, with its long history of continuous occupation, has a series of layers from its Hellenistic, Roman, medieval and Ottoman past among other periods. Like sedimentary rock, exploration of key sites like the citadel at Aleppo reveals an invocation of the past both through the selection of its site and particular design elements. Buildings, particularly for the period I specialize in, the European Middle Ages, often take a long time to build. Their design, as Marvin Trachtenberg has brilliantly demonstrated in *Building-in-Time*, unfolded and changed over time rather than follow the modern practice of being fully established and agreed upon before construction began.¹

Medieval churches, for example, often underwent drastic change throughout their history, with parts of the building, such as the choir, being replaced sometimes due to disastrous fires, a need for more space, a new patron's wish to modernize part of the structure or collapses. At Ely Cathedral, for example, the east end was expanded between 1234 and 1252 when six bays were added to the earlier Norman fabric. The collapse of the central crossing tower in the early fourteenth century then led to the construction of the spectacular octagonal tower as well as the replacement of the original Norman chancel to the east. Renovations, additions, changes in function lead to architectural revisions in all periods and places. Changing urban fabrics also affect how buildings function as well as their context, as popularly explained by Virginia Lee Burton's award winning *The Little House* book of 1942 for children (Fig. 1).² The little house, which is the subject of the book, begins as a site of cozy domesticity in an idyllic rural setting, which is transformed by development portrayed as dirty, noisy and oppressive.

¹ Marvin Trachtenberg, *Building in Time* (New Haven: Yale University Press, 2010).

² Virginia Lee Burton, *The Little House*. (Boston: Houghton Mifflin, 1942).

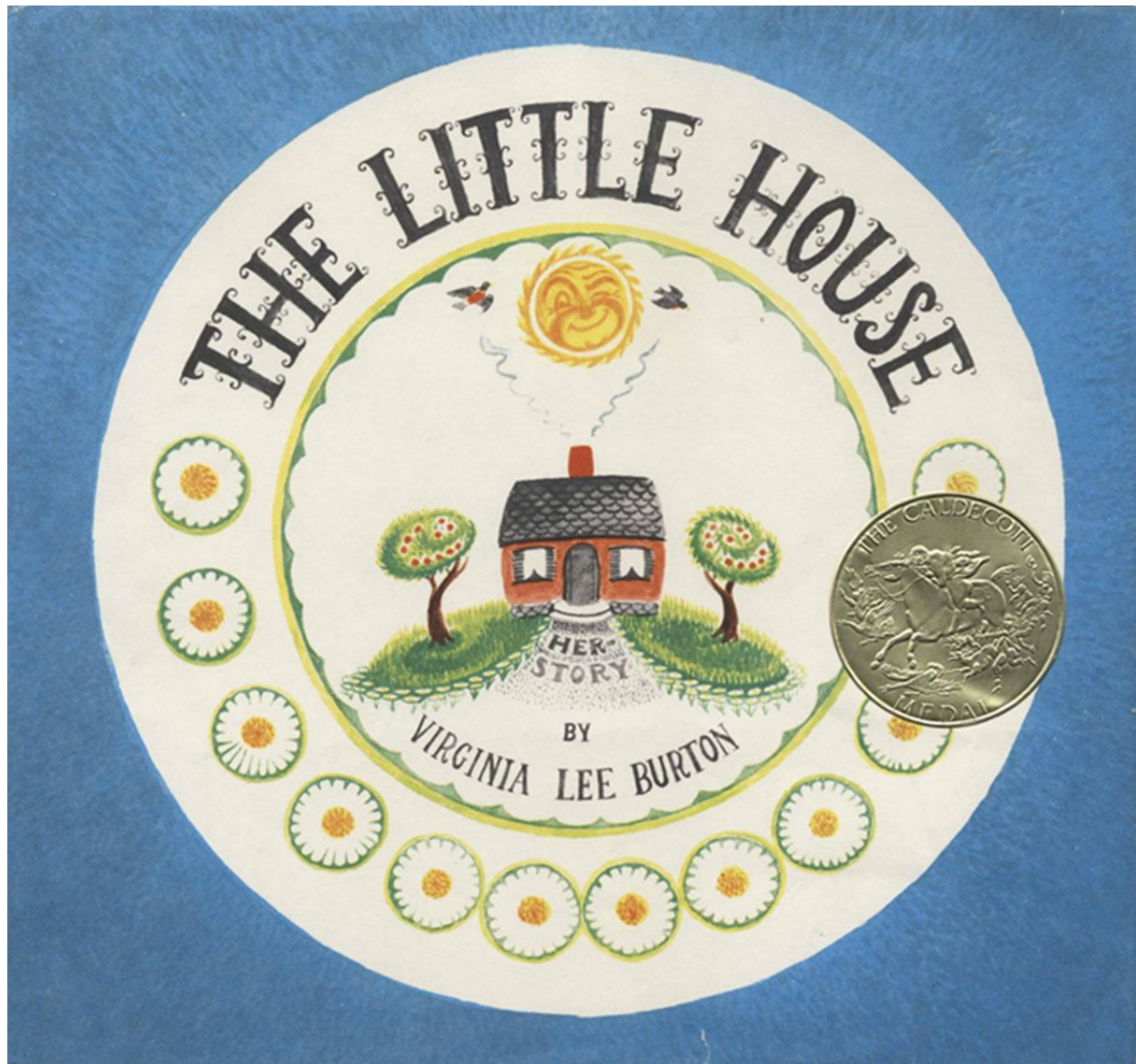


Figure 1. Cover from *The Little House* by Virginia Lee Burton (Boston: HMH, 1942).

As the house becomes increasingly urbanized, it also becomes more derelict and is ultimately only saved by being moved to a new location out in the country again. Highway construction in the 1960s such as that of I-84 in Harford often destroyed historic neighborhoods as well as isolating those that remained both from each other and from the city's commercial and public spaces due to the barriers formed by the massive roadways inserted into the urban fabric. This process, which imposed wide scale destruction on major American cities, has only recently begun to be reversed by projects like Boston's Big Dig, which has reconnected the

city's neighborhoods by moving its highways underground.

Disadvantages of the Traditional Periodic Interpretation of Buildings

At the same time, we tend to examine architecture, at the scale of the individual monument in particular, strictly as if it were a stable artifact providing a window into a particular time or place. For example, the Oxford Art Online discussion of Ely Cathedral discusses each phase of the

building's construction and restoration as a separate development with only cursory reference to the fact that the thirteenth century Gothic chancel was added to the pre-existing four-bay Norman chancel.³ Throughout the study of English medieval architecture the relationship of later medieval design to the fact that it is almost always applied as an addition or renovation to a Norman building has not received substantial analysis with the result that our understanding of English Gothic is limited. In fact buildings, like their environments, are essentially organic as Wolfgang Lotz described them, in the sense that they have the ability to grow, develop and respond to stimuli.⁴ Of course unlike plants or animals, buildings do not generate change of their own accord but these developments typically reflect human intervention sometimes in the form of restoration as seen at the Cathedral of Notre-Dame in Paris where part of this medieval building was returned to its original four story elevation during the restoration work completed by Viollet-le-Duc in 1864. Other architectural interventions include modernizations in a variety of times and places including the medieval as demonstrated by St. Albans where the six bays of the south wall of Romanesque nave replaced in 1323 provide a stark contrast between the Romanesque fabric and the newer Gothic fabric. Additions are another form of human intervention as represented by the dramatic Baroque eighteenth century Obradoira façade added in front of the Romanesque twelfth century Pórtico della Gloria at Santiago de Compostela.

Despite the fact that these dynamic aspects of building history are well known, architectural historians tend to focus on particular moments in a building's or city's past, a situation particularly evident in the case of complex structures with long chronologies such as medieval cathedrals. For

traditional stylistic analysis, this approach enabled the establishment of how particular styles emerged or became refined over time. The study of late medieval, or Gothic architecture is a classic example of this approach. Its narrative conventionally begins with Suger's work at St. Denis in the 1140s and goes on to trace the evolution, a term I use here as deliberately paralleling this type of study, of the ever taller, thinner and more skeletal examples of Laon, Paris, Chartres, Reims and Amiens cathedrals represented in Louis Grodecki's famous diagram of the elevations of Laon, Paris, Chartres, Reims and Amiens cathedrals.⁵ Such studies tended to ignore Gothic architecture when it took the form of a later addition to an earlier fabric, as seen at Autun where the Gothic choir windows and fifteenth century crossing tower are rarely discussed or the St. Laurent in Nogent sur Seine analyzed in Trachtenberg's study.⁶ Here the Gothic choir was in the process of being replaced by a sixteenth century Renaissance structure when construction stopped. Other approaches also demand a focus on a particular moment in a building's history. Contextual studies such as Jane Williams' outstanding analysis of Chartres made apparent the complex political and economic situation surrounding the construction of this cathedral in the late twelfth and early thirteenth centuries.⁷ Similarly, on a larger scale, Hilary Ballon considered the early seventeenth century transformation of Paris from a medieval city into a modern one in her compelling volume, *The Paris of Henry IV*.⁸ Period specific histories do in fact tell us a great deal about buildings and the design process associated with them. But, our study of architecture would also benefit from understanding how buildings continue to respond to new circumstances whether due to changing functions, structural damage as with the Ely Octagon or the need for more space or modernization as in the Ely Choir. The Ely

³ Philip Lindley, "Ely Cathedral" <http://www.oxfordartonline.com.proxy.its.virginia.edu/subscriber/article/grove/art/T025930?q=ely+cathedral&search=quick&pos=1&start=1#firsthit> Accessed November 20, 2014.

⁴ See Wolfgang Lotz, "Review of *Mittelalterliche Stadtbaukunst in der Toskana*, by Wolfgang Braunsfels," *Art Bulletin* 37:1 (March 1955): 65-7. For the most recent discussion of this aspect of Lotz's work and Trachtenberg's analysis of it see Niall Atkinson, "The Italian Piazza: From Gothic Footnote to Baroque Theater," in *A Companion to Renaissance and Baroque Art*, eds. Babette Bohn and James M. Saslow (Chichester: Wiley-Blackwell, 2013), 567-9.

⁵ Louis Grodecki, *Gothic Architecture* (New York: Harry Abrams, 1977) figure 8.

⁶ Marvin Trachtenberg, *Building in Time* (New Haven: Yale University Press, 2010), 411-15.

⁷ Jane Welch Williams, *Bread, Wine & Money: the Windows of the Trades at Chartres Cathedral* (Chicago: University of Chicago Press, 1993).

⁸ Hilary Ballon, *The Paris of Henri IV: Architecture and Urbanism* (New York: Architectural History Foundation, 1991).

Octagon, for example, is not designed as a stand-alone structure without reference to the extant fabric of the building. Exploration of how later fabric relates (or doesn't) to earlier such as in the nave of St. Albans can also tell us something about how buildings change over time and invoke earlier design in ways that we may not have yet understood. The lengthy building history of many medieval structures as well as the design process which underwent revision over time makes this a particularly critical issue for this period.⁹

The Life of a Building

New methodologies make it possible to add to the current rich variety of approaches available to the architectural historian in order to consider the dynamic history of the forms we study. When we look at buildings in a period specific way, for my field that generally means only one part of a building's life. Typically it is the part that most closely accords with canonical notions of privileging change, innovation or perceived influential exemplars. We look for the earliest evidence of a particular Renaissance form or the first use of ribbed vaults or the most perfect and influential Egyptian pyramid or Doric temple. These are the types of buildings that still dominate survey textbooks as well as scholarly journals although increasingly less so.¹⁰ Only recently have scholars begun to consider the ongoing life of a building like the Parthenon beyond its moment of creation.¹¹ The traditional approach of focusing on a particular moment or period in the life of a building is not surprising given that our training has been and is becoming even more increasingly period specific. Modern culture also tends to esteem the artist or in this case, architect, in his or her role as an innovator and person of influence so we often look for the same qualities in our study of

the past. The demise of the monograph as a form of scholarly publication has also contributed to this focus on an architectural moment. Admittedly subjects were often favored which were period specific, but a true architectural monograph would consider a building's total story, a narrative which considers the monument's ongoing life beyond specific moments of initial design and construction.

As with most generalizations, there are of course exceptions to this one. Kevin Murphy's groundbreaking study *Memory and Modernity: Viollet-le-Duc at Vézelay* expands the study of this canonical Romanesque monument from its moment of inception to its ongoing role in nineteenth century French cultural history as well as the role of architectural preservation in shaping the historical narrative.¹² Here, Viollet added flying buttresses to the building which while they were not part of its original design, were critical to his vision of the building and the development of medieval architecture. Another might be how the history of the site has affected the building's meaning and form as is so critical at the Dome of the Rock.¹³ While I am not advocating totally abandoning period specific studies, I am suggesting there is also a place and a need for more complete analyses of a building's life story. Such investigations can reveal how change in program, function or context can affect a building's appearance, use or meaning. We can also understand how a building relates to its changing urban context if we analyze how it has changed over time in terms of access, lighting, and signage for example. This approach also highlights the fact that architecture is rarely, if ever, the product of an individual. It reflects issues of patronage, building codes, site, urban context and changing programs among others. Accommodating a building's site involves, addressing topography, extant infrastructure, and rights of access as well as pre-

⁹ For a discussion of this topic which is so critical for medieval buildings with their lengthy building histories see Caroline Bruzelius, "TedxDuke Visual Space and Technology" <https://www.youtube.com/watch?v=eYihueongzg&feature=youtu.be> Date Accessed 7 March 2015 as well as Trachtenberg, *Building in Time*.

¹⁰ See for example, Fred Kleiner, *Gardner's Art Through the Ages*. 14th edition (Boston: Wadsworth, 2013).

¹¹ See for example, John Pollini, "Christian Desecration and Mutilation of the Parthenon," *Mitteilungen des Deutschen Archäologischen Instituts: Athenische Abteilung*, 122 (2007): 207-37.

¹² Kevin D. Murphy, *Memory and Modernity: Viollet-le-Duc at Vézelay* (University Park, PA: Pennsylvania State Press, 2000).

¹³ For further discussion of how this building has changed over time see: Oleg Grabar, *The Dome of the Rock*. (Cambridge: the Belknap Press at Harvard University Press, 2006).

existing both beneath the planned structure and nearby.

As a faculty member in a design school, these issues are of particular relevance as they can suggest strategies for managing architectural change whether in developing urban planning policies or individual building renovations and additions. The latter is particularly significant given that most current design work is in the form of modifications to extant structures. One question rarely fully answered by current studies is how additions or renovations to extant buildings have related to the earlier fabric historically. Do they ignore it and simply build as if the earlier fabric were not present? Or do they in some way, perhaps not immediately apparent, incorporate references to it or imitate it directly as with the Gothic choir added to Southwell Minster's Romanesque nave? While some questions related to these types of investigations may be answerable with traditional methodologies such as building archaeology or archival work, they may also benefit from newer approaches, specifically the use of digital technologies both to establish and represent the ongoing history of a building, site or city. Examining changes in urban fabric may help us understand how buildings have been adjusted to their new surroundings through alterations to their access or orientation.

Digital Technologies and Architectural Change

Digital technologies have been widely implemented in the study of architectural history and have revolutionized our ability to show multiple comprehensive views of large and complex monuments or cities. Often they are used for the reverse of the approach I am suggesting; rather than supporting the analysis of the complex and messy history of architecture, they are used to erase later interventions and recapture the original appearance of the structure. UCLA's Santiago de Compostela project comes to mind as

an excellent example of this type of digital modeling.¹⁴ It is described as a restoration project in that it models the building and its urban context as both appeared on the day of the church's dedication, April 3, 1211. By recovering the original appearance and physical context of the building, we can understand how the church responded to its urban setting as well as its original overall effect. Both are particularly difficult to imagine given the many interventions in Santiago's long and continuing history as a pilgrimage site. The originally Romanesque fabric now includes many later interventions, including a Baroque façade and altarpiece. These are stripped away in the UCLA project to provide an image of the original church.

The MonArch website developed by Sheila Bonde and Clark Maines is another successful application of digital tools to architectural history, in this case to provide a more holistic examination of medieval monasticism which enables us to understand complexes such as the medieval Augustinian abbey of Saint-Jean-des-Vignes as expressions of "spiritual, social and economic motives rather than simply a construction site."¹⁵ While the site certainly acknowledges the complicated and dynamic architectural history of the abbey at least from the eleventh to the seventeenth centuries, representation of this longer narrative is not its focus. Rather it provides an in depth analysis of monastic life during one part of this institution's history: the Middle Ages.

Similarly, the Rome Reborn project has created a model of the city using the notional date of June 21, 320 CE to show how Rome appeared in Late Antiquity. Ultimately the site aims to create a series of "3D digital models illustrating the urban development of ancient Rome from the first settlement in the Bronze Age (ca. 1000 BCE) to the depopulation of the city in the early Middle Ages (c. 550 CE)."¹⁶ This representation of Late Antique

¹⁴ Some information about the UCLA Santiago de Compostela project is available at <https://idre.ucla.edu/gis-visualization/santiago-de-compostela> and <http://etc.ucla.edu/research/projects/compostela/>. (Accessed 11/2/2014).

¹⁵ Sheila Bonde & Clark Maines, *Saint-Jean-des-Vignes*. <http://monarch.brown.edu/monarch/intro.html> (Accessed November 3, 2014).

¹⁶ Bernard Frischer, *Rome Reborn*. <http://romereborn.frischerconsulting.com> (Accessed November 3, 2014).

Rome is astonishing in both its detail and comprehensiveness and remarkably useful for both scholars and students. At the same time, it would be interesting to lengthen the chronology of the city, at least for key sites such as the forum, and show their ongoing use and development throughout the medieval and later periods. As with all such projects, it can be difficult to determine from the virtual model, which aspects are based on primary evidence and which are more conjectural reconstructions. Creating one model that is usable by the interested public as well as scholars presents its own set of challenges as it can be difficult to convey the wide range of sources used in designing the reconstruction.

But in addition to their usefulness in creating reconstructions and disseminating those models as well as related scholarship, digital tools can be used to develop an ongoing narrative of a building, city or site. Rather than recapturing a particular moment in a building's history or returning it to a kind of digitally static existence, it is possible to create a kind of continuous biography of a building and explore how its changes over time relate to one another.

Neatline + Architecture = Change over Time

One relatively recently developed tool, known as Neatline, greatly enhances our ability to show change over time.¹⁷ Neatline is the name given to a suite of plugins for the open source web application Omeka, a platform for content management and web publication.¹⁸ Users can create virtual exhibitions using maps, images, texts and models in conjunction with an interactive timeline.¹⁹ You can track change across time and place with this dynamic exhibition tool which allows a visual display of change unlike

static images used in presentation tools such as Powerpoint.

Although the tool was developed initially in relation to the study of literary sources such as the letters of civil war cartographer Jedediah Hotchkiss to his daughter, applications to architectural history are immediately apparent.²⁰ As a historian of medieval architecture, Neatline provides the opportunity to show the analyses of the medieval design process across the lengthy building history of a particular case study I have begun using more sophisticated model building software such as Autocad. These exhibitions are easily accessible via the Internet and do not require any specialized skill or software. Neatline provides a dynamic means of display that shows how the building changes in relation to time as models and plans as well as photographs and text developed outside Neatline can be imported into a virtual exhibition. The final product can capture the dynamic nature of changes to the building over time using a variety of tools including layering, image changes or models that unfold as the date changes.

The visualizations made possible by Neatline using its mapping and timeline tool are ideal for showing the kind of change over time discussed above as critical to understanding fully and representing clearly more complete architectural narratives. While the tool is relatively new, initially released in 2013, I began using it while it was still in development to explore architectural history in a variety of ways. Given the relative ease with which a Neatline exhibit can be developed, it can be used as a stage in scholarly research as in my analysis of the changing history of Southwell Minster or as part of students' work in understanding and representing change in architecture on a variety of scales. Although Neatline has countless applications to architectural history, I will look at three particular examples.

¹⁷ Neatline, www.neatline.org (Accessed November 3, 2014).

¹⁸ Omeka, <http://omeka.org> (Accessed November 3, 2014).

¹⁹ Neatline's developers, based at my home institution of the University of Virginia, describe it as a "geotemporal exhibit-builder that allows you to create beautiful, complex maps and narrative sequences from collections of archives and artifacts, and to connect your maps and narratives with timelines that are more-than-usually sensitive to ambiguity and nuance." About Neatline, <http://www.neatline.org/about/> (Accessed November 4, 2014).

²⁰ "My Dear Little Nelly: Hotchkiss Maps the Battle of Fredericksburg for his Child" <http://hotchkiss.neatline.org/neatline-exhibits/show/my-dear-little-nelly/fullscreen> (Accessed November 4, 2014).



Figure 2. Southwell Nave 12th Century



Figure 3. Southwell Choir 1234-41

The exhibit on Southwell Minster is currently under development. It is designed to provide easy access to an exploration of the medieval design process using digital models. Southwell is typical of almost all English medieval churches in its combination of Romanesque and Gothic fabrics (Figs. 2 and 3).

construction, clearly planned and executed over a short period of time and then left alone. The consequences of this history, however, for its later medieval design have not been explored.

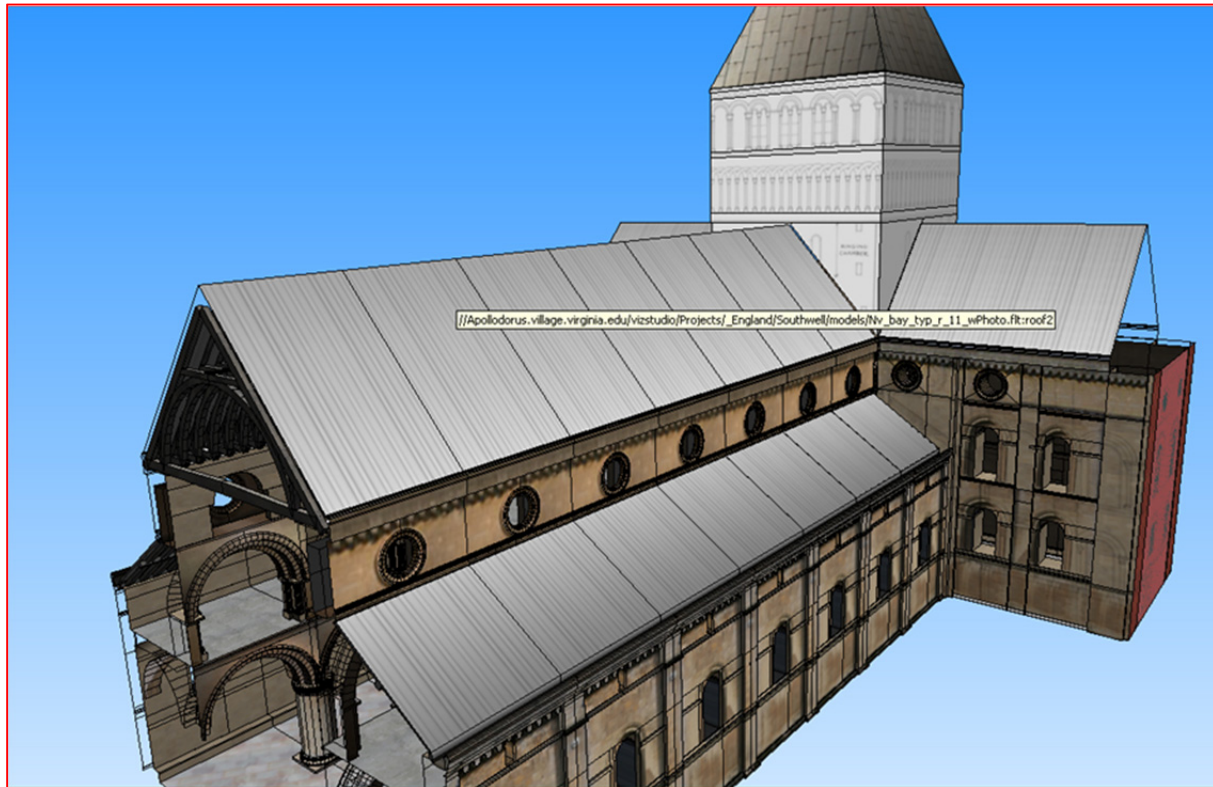


Figure 4a. Image of Southwell Model Broken Apart

English medieval churches are fairly messy places chronologically. They generally have complex building histories reflecting a process of lengthy construction, later additions and replacements of fabric damaged in fires or tower collapses as we saw at Ely. Here at Southwell, the Norman east end was replaced by Archbishop Walter de Grey of York (held office 1216-55), an ambitious architectural patron who may have sought to increase the prestige of Southwell through the construction of a larger and more up to date east end. The original Norman nave survives. Thus, like many medieval buildings, Southwell is the accumulation of many phases of building and rebuilding rather than simply one phase of

Together with a team from the Institute for Advanced Technology in the Humanities at UVA, I have developed a series of digital models using a range of modeling software, including Autocad, for different phases of the building's history that can be accurately measured and cut apart for comparison (Figs. 4a and 4b).

Our aim is to analyze the design of each part of the building and determine whether later sections refer to earlier ones in their proportional systems, geometries, lighting values etc. Figure 5 is an image of this dynamic model that illustrates how the measurements and proportional systems of the two parts of the building can be readily compared. These models were developed using a

variety of softwares and incorporating information from measured drawings, laser scans, photographs and textual sources.

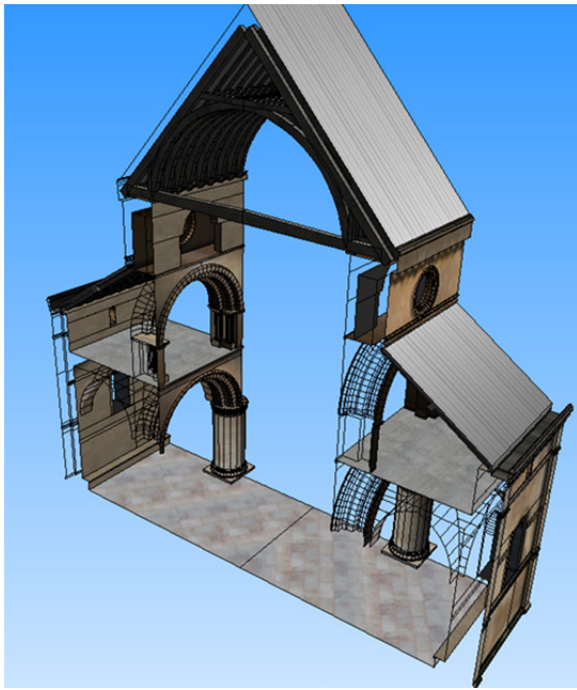


Figure 4b. Image of Southwell Model Broken Apart

While these models are inevitably complex and large, which has made making them publicly available difficult, Neatline has provided a way to exhibit them and make apparent the change over time that takes place at Southwell across the building's history (Figures 6-7).²¹

Figures 6 and 7 illustrate the change in plan and section between the twelfth and thirteenth centuries with the accompanying timeline, which is dynamic in the link cited in note 17. Its prestigious and ambitious patron replaces the Norman choir at Southwell in order to provide a more elaborate and modern setting for the liturgical ritual conducted by the clergy at the minster. Its design is apparently grafted on to the Norman fabric although the spacing of its bays and wall thickness in preliminary analyses of the information provided by the model suggest that, despite its disjunctive appearance, the later fabric was, in fact, planned in relation to the earlier building to its west.

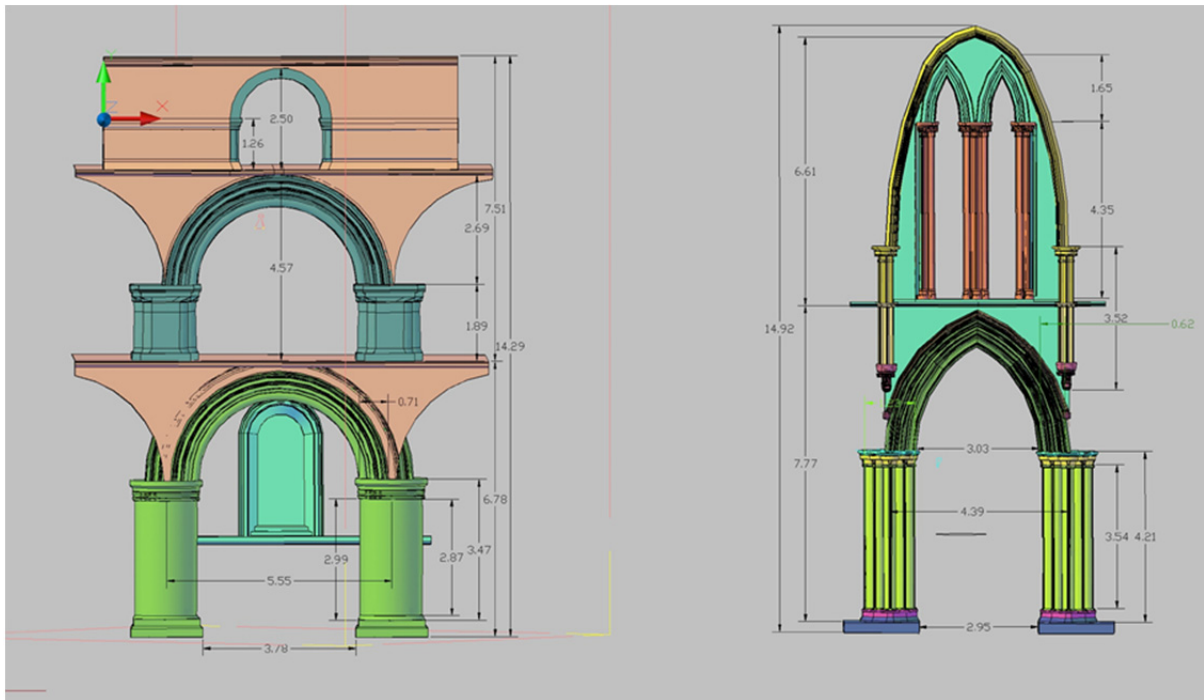


Figure 5. Sample Bays extracted from Southwell Model of the Norman Nave and Gothic Choir labeled with Measurements for Comparison.

²¹ See <http://arh1010.neatline-uva.org/neatline/fullscreen/southwell-test-cross-sections> (Accessed November 5, 2014). Chrome is the best browser to use with neatline.

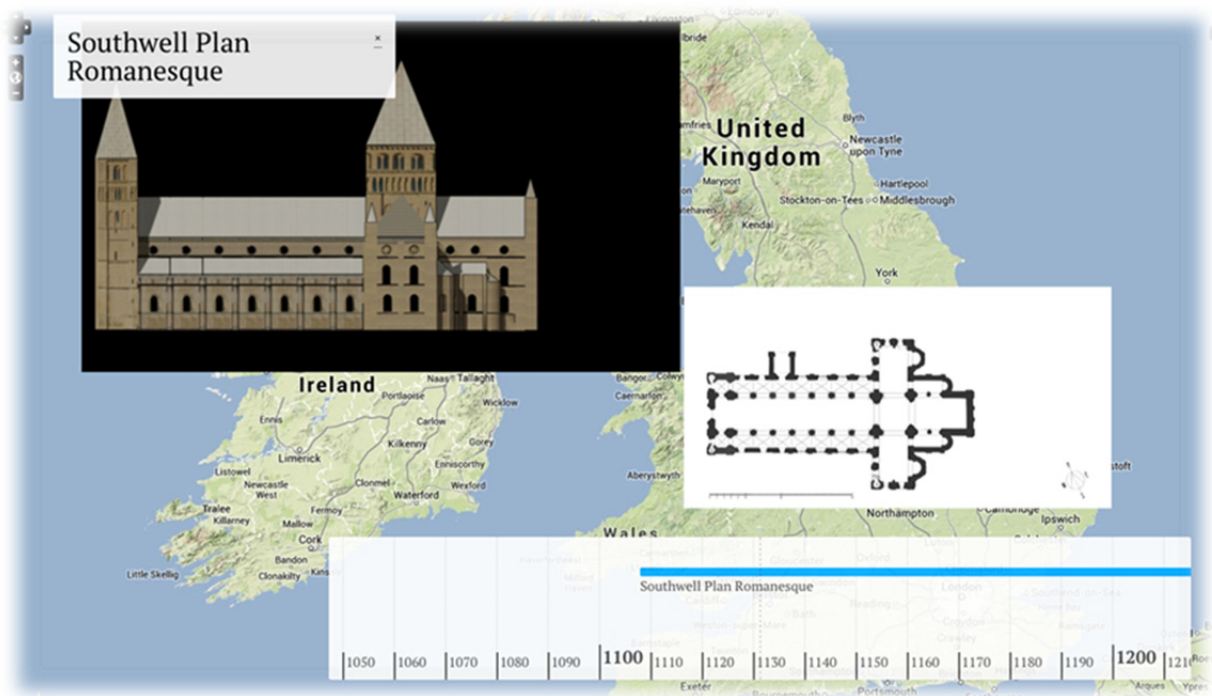


Figure 6. Romanesque Southwell

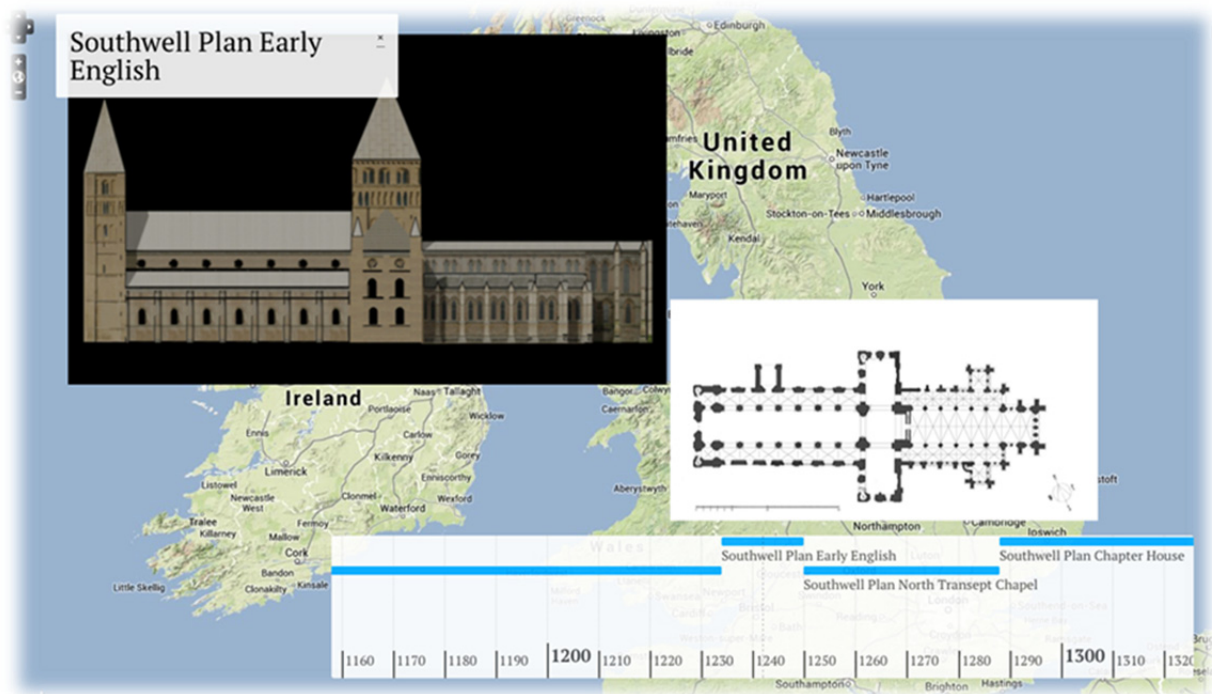


Figure 7. Early English Southwell

English Gothic architecture's thick walls and heavy moldings are frequently discussed as related to the fact that it is almost always an addition to earlier fabric but a close analysis of how English Gothic church fabric was integrated into preexisting Romanesque or Norman fabric remains to be conducted.

The changing architectural context for Southwell, in terms of contemporary construction at related sites is also shown in another part of the exhibit as a way of explaining what external influences may be a factor in Southwell's changing appearance.

While this exhibit focuses on architecture on the micro-level, that is, it examines an individual monument, the timeline and map function of Neatline makes analysis of architecture on the larger scale possible. Geo-referenced maps can be imported as exhibition items into Neatline and annotated to show movement, site outlines or topographic features for example. Maps of different historic eras can be layered so the map can also change over time. As the demonstration exhibit on Pic d'Anie illustrates, Neatline is also excellent for view-shed analysis which allows the user to examine the area of land or water visible from a particular vantage point.²²

While this exhibit is looking strictly at topographical features, the tool can be readily applied to architecture with the aim of understanding how a building can be seen from different key vantage points, often recapturing the original experience of viewing the building. Conversely, the views from the building can also be clearly constructed and marked using vectors. Ed Triplett has used this form of analysis in his study of the architecture of Christian military orders on the Spanish Border with Islam between 1150 and 1400.²³ His project, in part, maps the constantly shifting frontier between the two and uses view-shed analysis to establish how sites along the changing border may have been chosen

for the construction of fortress-monasteries.²⁴ It allows him to demonstrate what could be seen from each of the fortresses as well as from where they could be seen. Neatline will make his analysis readily available. Neatline can also be used to understand the urban history and the ongoing use of sites. As part of a course on the hajj in the Middle Ages centered on the diary of Ibn Jubayr, my students created exhibits in spring 2014, which looked at the changing history of sites visited by the twelfth century pilgrim.²⁵ The exhibits for Aleppo and Damascus make the viewer acutely aware of the long history of use and reuse of key sites such as the fortress in Aleppo. It can also highlight the role colonization, from the Roman and French rule of Syria for example, continues to have on the urban plan of Damascus as the exhibit seamlessly transforms the plan using the timeline. Finally, an exhibit on the changing nature of the hajj compares Ibn Jubayr's experience with that of modern pilgrim's while also exploring the texts involved in the hajj's original organization and codification as well as the changing built environment of Mecca as related to the hajj (Fig.8).²⁶

While many of the points about Mecca's modernization as the Saudi government deals with the ever increasing number of pilgrims or the view-sheds along the Christian/Muslim frontier in Spain can be explained in text or with a series of still images, what Neatline does when you can see it "live" is make apparent the relationship between different historical periods at a site and the often fluid nature of architectural history. The dynamic nature of the exhibit tool itself makes manifest the dynamic nature of architecture – something that is constantly being transformed as its context, form and audience change over time.

²² Pic d'Anie <http://www.neatline.org/demos/> (Accessed November 4, 2014).

²³ "A Wall of the Faithful: Spatial Analysis of Military Order Architecture on Medieval Iberia's Religious Frontier," <http://www.edwardtriplett.com/research/dissertation/> (Accessed November 4, 2014).

²⁴ <http://www.edwardtriplett.com/research/viewsheds/> (Accessed November 4, 2014).

²⁵ Ibn Jubayr, *The Travels of Ibn Jubayr*, trans. (Delhi: Goodwood Books, 2007, reprint). <http://ibnjubayr.neatline-uva.org> (Accessed November 4, 2014).

²⁶ <http://ibnjubayr.neatline-uva.org> (Accessed November 4, 2014).

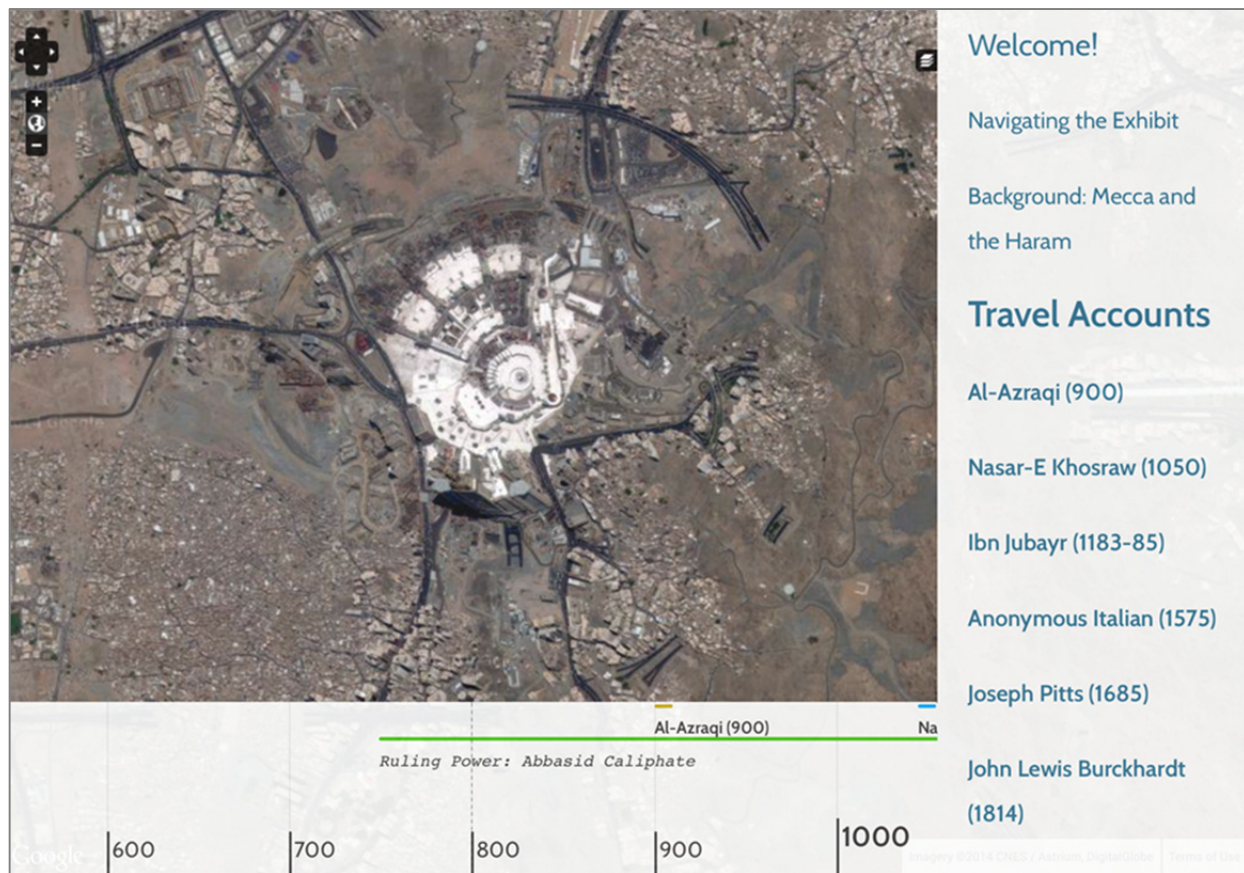


Figure 8. Screenshot of Opening Page of “Perspectives on the Haram” Exhibit <http://ibnjubayr.neatline-uva.org/neatline/fullscreen/perspectives-on-the-haram> (Accessed November 20, 2014).