

## CHAPTER 3

# The Digital Revolution and Modeling Time and Change in Historic Buildings and Cities

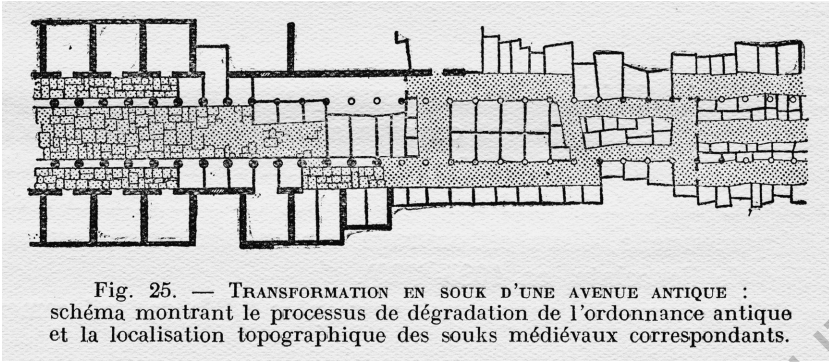
### *The Case of Visualizing Venice*

CAROLINE BRUZELIUS

#### INTRODUCTION

Cities, like amoebas, change shape. They expand, they contract. They evolve in certain ways at certain times, often for reasons that have little or nothing to do with deliberate or conscious planning and design.<sup>1</sup> Over time, spaces are renegotiated to serve shifting social, environmental, political, or economic purposes,<sup>2</sup> as Jean Sauvaget showed so brilliantly in 1941, illustrating how an ancient colonnaded street evolved into a Muslim souk (figure 3.1).

In Rome, the forum with its great monuments degraded in late antiquity into a cow pasture, but in the early modern period developed into a densely packed residential quarter, only to be voided in the fourth decade of the twentieth century by Mussolini for political and ideological reasons.<sup>3</sup> And at present, the cities that have become destinations for tourists are being modified to suit the demands of leisure travelers: Florence and many other Italian urban centers have closed some streets to enable the flow of tourists from site to site, and local residents often escape to peripheral areas where they can park and use elevators. As a result, the experience of a historic monuments, once immersed in the humming life of a city that was packed with houses and shops, is lost in favor of isolated monumentalization. The pernicious effects of modern tourism exacerbate a separation between historic monument and the



**Figure 3.1** View of an ancient street in Aleppo as it transforms into a Muslim souk.  
 Source: Sauvaget 1941, 104, Fig. 25.

city that had begun in the nineteenth century, when shops and other buildings that once clustered like beehives around major sites were demolished to create isolated monumental splendor for the building and large open squares, generating vistas: the *parvis* in front of Notre-Dame Cathedral in Paris comes to mind.

### BUILDINGS IN CITIES AND TIME

Change flows from the past into an ineffable and unknowable future. An individual encounters a building or a city in a moment of its ongoing processes of change; her or his experience intersects only briefly with the “long life” of monuments and places, which, after that encounter, will continue to be renegotiated in imponderable ways. There is another aspect of flow and change, as well: in the past, and especially in the medieval period, the construction of large structures was in itself a long-term process that was often characterized by a certain fluidity in the working out of details and design. Medieval buildings were produced in fluid construction environments, frequently subject to change of many kinds *within the period of construction*. These changes could be in building methods, materials, design, and even the plan. For example, in many of the most prominent Florentine churches, façades were left incomplete until the nineteenth century (the Cathedral and Santa Croce), and at the Dominican church of Santa Maria Novella, only the lower part of the façade with its portals and tomb niches existed prior to Alberti’s sixteenth-century intervention.<sup>4</sup> The Gothic cathedrals of France—buildings that are viewed as governed by rules of order and proportion—underwent many modifications during construction. Reims Cathedral was lengthened by several bays; at Saint-Denis, had the new choir begun by Abbot Suger (1144) been joined to

the abbot's west façade inaugurated in 1140, there would have been an awkward junction between the two very different plans.

There are thus two kinds of time and change that affect our understanding and representation of monuments: the moment in which we ourselves encounter a building or city, and the time (and change) that may have been entailed in its own coming into being in the past.

Representing change as ongoing process in man-made space has been especially challenging for the *longue durée* of ancient and medieval sites. This challenge applies to almost any historic city or monumental architectural enterprise. It is interesting to note that one of the few scholars to actively engage in representing change over time and the process of ongoing transformation, Jean Sauvaget (1901–1950), was an anthropologist, as well as an archaeologist.<sup>5</sup> His interests extended from classical antiquity through the Ottoman period, and ranged from architecture to pottery, to city planning. It is perhaps appropriate that as an anthropologist he focused on the shifting function of space, and his understanding that all history is based on people (and how people change) no doubt informed the creation of his image of the transformation of an ancient colonnaded avenue into a Muslim souk.

## VISUALIZING VENICE: A RESEARCH AND TEACHING INITIATIVE

Prior to the digital revolution, change and process could only be represented as sequential static images that illustrated how buildings and cities were transformed as a series of isolated “frozen moments.” For example, images of the medieval walls of Florence show them as a completed project, with no indication of the long, slow process of constructing a defensive system that gradually expanded around the city over multiple decades as property was expropriated and houses were demolished.<sup>6</sup> Although urban defense systems inevitably have the function of defining the edge of a city, marking and fixing borders and emphasizing the transition from countryside to urban space, our traditional methods of representing city walls in static images belie the fact that these (and most other) fortifications came into being over decades, as funds were raised, property was expropriated, and houses were demolished: an animation on the construction of the urban defense system would be a far more accurate method of representing this process than a static image.

The description of sites and monuments in print is static, not fluid. Until now, city plans and representations of buildings have not been able to show the slow *process of becoming in time* of a monumental structure, or urban space. The few new cities that were designed from the outset as a “concept”—either in the past, as in the new towns of the Middle Ages (Aigues-Mortes, for example), or in the modern period (such as Canberra) nonetheless

continue to evolve in an ongoing state of flux that constantly renegotiates the original plan to serve new needs. Canberra today echoes only the broadest outlines of Marion Mahony Griffin and Walter Burley Griffin's original designs. Historic cities, such as Siena, crept forward over centuries to cover adjacent ridges and along the main road from Rome to northern Europe (the Via Francigena) as travel and commerce expanded in the twelfth and thirteenth centuries. Often, as in Siena, certain types of institutions, often the convents of the religious orders and adjacent piazzas, "anchored" a new area of town, attracting shops that would serve expanding communities; in medieval Italy and elsewhere, communal governments often supported these anchoring institutions to promote expansion and growth.

The disjuncture between the traditional methods of visual representation and the actual *process of becoming* is analogous in monumental architecture, especially the buildings of the Middle Ages, which were constructed over decades or even centuries, and underwent modification and change of design even while under construction.<sup>7</sup> Our understanding of the evolving process of creating a historic building within a fluid construction environment has been conditioned and restricted by our tools for representation (plans, sections, elevations, photographs, reconstruction drawings), which tend to show the whole rather than a *successive aggregation of parts*. In other words, the nature of our capacities of representation, partnered with a desire for the concepts of harmony, unity, and visual coherence, collaborated with and perhaps stimulated a formalist approach to art and architectural history, especially in the second half of the twentieth century. A desire for aesthetic unity superseded the visible reality of change and process, and this, in part, is because we did not have the tools to represent these phenomena as occurring in the fluidity and unpredictability of ongoing time. Thus, when we consider a historic monument, such as the Cathedral or Santa Croce in Florence, or Santa Maria Gloriosa dei Frari in Venice, we experience (either in person on site or in publication) these structures in their completed state rather than comprehending them as the aggregation of incremental gestures that slowly brought a building or space into being, often over decades or centuries. One of the most notable and beautifully documented examples of this process of change and design fluidity, as well as its implications for an architect, is Michelangelo's work on the transept arms of Saint Peter's Basilica in Rome, a phenomenon documented by Howard Burns on the basis of Michelangelo's letters.<sup>8</sup>

Slow, ongoing process of construction and modification are also characteristics of urban space in relation to the insertion of large-scale buildings or institutions such as hospitals or convents, which entailed the destruction of preexisting structures to make space, a phenomenon particularly acute (and painful) in the crowded cities of the thirteenth and fourteenth centuries. The making of large-scale historic buildings, such as a cathedral, would have profoundly disrupted surrounding areas and thus, as urban interventions had a

ripple effect, entailing decades of upheaval. At Santa Maria Gloriosa dei' Frari in Venice, construction moved forward at an aching slow pace, as individual donors contributed one column at a time; and as this occurred, we can probably imagine the surrounding piazza and neighboring structures being reconfigured or demolished in response.

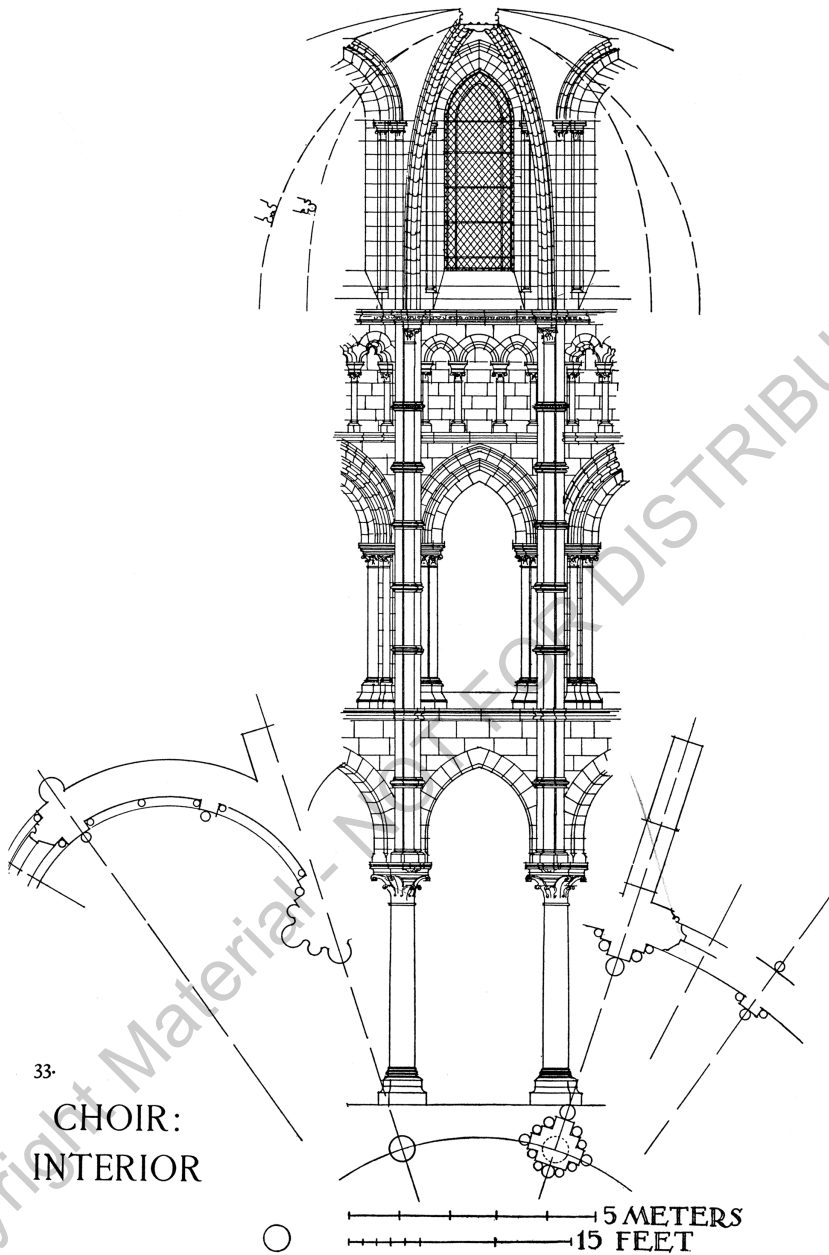
The study of medieval cities and buildings can often reveal an ongoing internal dialogue between initial design and subsequent phases of construction; this was evident not only in my work on Notre-Dame Cathedral in Paris<sup>9</sup> but also at the Cathedral of Noyon. Elevation drawings of the chevet (figure 3.2) show heavy upper stories with multiple and layered moldings precariously perched over slender *en délit* columns of the hemicycle below.

Was there a change in architect to account for the profound transformation of design between the arcade at hemicycle level and the gallery above?<sup>10</sup> Was there yet another master builder who took over as construction at Noyon moved from east to west, introducing an entirely new concept with superimposed wall passages in the transept? These disjunctions and their implications have not yet been seriously addressed in the literature on this building.

Representations of buildings in the traditional form of elevations and sections provide vital information, but they cannot address the ongoing nature of disjunction and process. Drawings, plans, sections, elevations, and maps condition historical narratives toward a presentation of coherence and continuity. The traditional tools of representation incline scholars to study buildings and cities as completed projects rather than as an ongoing *process of becoming*: the predilection to see and understand buildings and spaces as total concept and coherent space has superseded that of understanding them as progressively negotiated interventions.

All this is obvious, at least to a medievalist who has spent a lifetime studying historic buildings and spaces. And while of course historians study the process of constructing a building or shaping a city, the tools of representation have privileged interpretations of coherent and complete vision as “ideal” project (in Albertian terms of coherent design), rather than the evolving and fluid *process* of design and construction. In many ways, the fifteenth century seems to have been a critical moment for this shift, for there were not only the treatises of Alberti and the concretized notion of the “ideal project” but also the invention of printing (and therefore also of “fixing” an image through the multiplication of publication).<sup>11</sup>

Until the recent invention of digital technologies, particularly 3D modeling and mapping tools and animations, modes of representation available to the architectural or urban historian (maps, plans, photographs) were static. They could not easily engage with the creation of urban or architectural space as a *flow in time*.



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CHOIR:  
INTERIOR

Figure 3.2 Elevation of the choir of Noyon Cathedral.

Source: Seymour 1939, 111.

## VISUALIZING VENICE: A RESEARCH AND TEACHING INITIATIVE

Visualizing Venice (figure 3.3) is an international collaboration created by myself and Donatella Calabi in 2010 to explore the capacities of digital technologies to reflect *change as an ongoing process* and address the concept of cities and buildings as fluid construction environments.

Our primary goal has been to train and engage young scholars in understanding that digital technologies now form a critical and transformative part of the intellectual process, and that new tools stimulate new types of questions about evidence and radically new capacity for *narrating* the lives of buildings and cities. The goal of our initiative is to work against the notion of an idealized, “authorial,” and “fixed” understanding of built space, and instead to explore the intermittent adaptive interventions that respond to the vicissitudes of finances, available space, and changing use.<sup>12</sup> Visualizing Venice as a research initiative pushes against the constraints of traditional representation, engaging with the flow of a city and its buildings in time, examining the affordances of mapping and modeling technologies to produce 3D models and



Figure 3.3 The Visualizing Venice website logo.

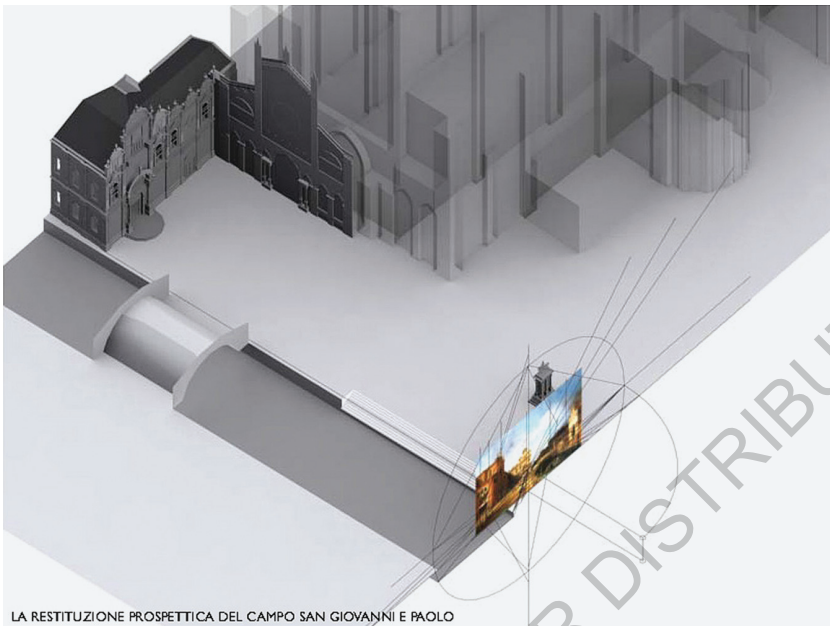
animations that reflect the transformation of cities and buildings as part of the organic, “amoeba-like” flow of change and adaptation in time.<sup>13</sup>

Visualizing Venice focuses on different types of interconnected experiments in mapping and modeling, and combines research with teaching and public outreach. Begun as a trial experiment in 2010 to map and model change in Venice over time, and to engage graduate scholars and recent PhDs in new representational tools, Visualizing Venice projects are documented by historic maps and cadasters. The initiative has grown to include annual training workshops, exhibitions, and a series of modeling projects that focus on different regions of the city.<sup>14</sup>

From the start, the research group has been committed to teaching and training, a concept that emerged from the experience and experiments of the Wired! lab at Duke University.<sup>15</sup> In 2009, there were few opportunities for graduate students to learn digital tools in the context of their home universities, as few departments had the combination of equipment, intellectual interest, and in-house expertise to support such integration of new modes of representation and analysis that digital technologies make possible. To achieve this goal, the Wired! group at Duke<sup>16</sup> created a digital laboratory at Venice International University to train students at all levels and teach best-practice technologies for gathering data, mapping, and modeling. We offer training for graduate students and young professionals in the fields of architectural preservation, architecture, art, architectural and urban history. The operational principle for the workshops is to teach a variety of digital technologies through the study of a particular topic—that is to say, through data collected on a certain theme. The first workshop (in 2012), taught in collaboration with Giorgio Gianighian (Università Iuav di Venezia, or IUAV), focused on the cisterns of Venice: how the system of provisioning fresh water conditioned the shaping of the city. Subsequent workshops concentrated on the relationships between the city and the lagoon (the topic of a major exhibition at Palazzo Ducale in Venice in 2015, curated by Donatella Calabi), the Venetian Ghetto, and the Biennale.<sup>17</sup> In 2016, the workshop returned to the topic of the Venetian Ghetto in commemoration of its founding five hundred years ago.

Visualizing Venice is also committed to research and the 3D modeling of change in buildings and cities. We first focused on the area of Santi Giovanni e Paolo, with a series of projects and collaborations that examined the transformation of this part of the city from circa 1500 to the present (figure 3.4).

Extended research by Gianmario Guidarelli and Ines Tolić investigated the various unbuilt projects for the development and expansion of the former convent into Venice’s primary hospital after the Napoleonic suppression of churches and convents.<sup>18</sup> Other collaborators modeled changes to the exterior of the Dominican basilica, as well as ideal routes of vision for the perspectival reliefs on the façade of the Scuola Grande di San Marco. Additional projects modeled the expansion of the Arsennale and the area around the Academia Museum (formerly the convent of Santa Maria della Carità). At



**Figure 3.4** Perspectival study of Santi Giovanni e Paolo based on Canaletto painting.  
*Source:* With kind permission of Andrea Giordano, the University of Padua.

Duke University, students working under the guidance of Kristin Lanzoni created interactive displays based on the De' Barbari map of circa 1500. Other important projects produced by members of the group include modeling growth and change at the city of Carpi, by Elena Svalduz and her colleagues at the University of Padua, as well as a wide range of digital interventions on the city and buildings of Padua.

There is considerable cross-fertilization of work, between the collaborators at the different partner universities and between the teaching and research projects. For example, material for the splendid exhibition on the provisioning of Venice (fall of 2014) on view at the Palazzo Ducale in Venice; "Aqua e Cibo" was related to the topic of the 2014 training workshop. Projects developed for the training session held in 2013 on the Venetian Ghetto are informing, and providing part of the data for, an upcoming exhibition and associated apps held in the summer of 2016 that commemorates the five hundredth anniversary of the founding of the first ghetto in Venice.

## CONCLUSION

Learning, research, modeling, and public outreach are woven into the Visualizing Venice enterprises. The team is deeply committed to the notion

that digital tools are transformative and essential for modeling space and structures in time. The capacities of these technologies are transforming our ability to engage in questions on man-made space, tracking its modification and transformation as social, political, economic, and religious institutions evolved. The digital option enable scholars to reach out to the public through websites and apps, engaging tourists, visitors, and students in a new way of understanding where they are and why places there look the way they do.

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