THE ROLE OF PAVEMENT IN THE PERCEIVED INTEGRATION OF PLAZAS:

AN ANALYSIS OF THE PAVING DESIGNS OF FOUR ITALIAN PIAZZAS

by

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A thesis submitted in partial fulfillment of
the requirements for the degree of

MASTER OF SCIENCE IN LANDSCAPE ARCHITECTURE

WASHINGTON STATE UNIVERSITY
The Department of Horticulture and Landscape Architecture

MAY 2005

To the Faculty of Washington State University:

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ACKNOWLEDGMENTS

To my "support group," thank you for being there.

To Brian, thank you for everything.

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Abstract

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May 2005

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The paving design of a plaza has a strong influence on that plaza's character, its coherence, and, ultimately, on its meaning. A well-designed pavement can offer human-scale pattern and interest, unite diverse architectural styles, heighten awareness of the volume of space, and relate the plaza to its context. Visual and mental connections between natural and designed elements across a range of scales can support the perception of a plaza as an integrated whole, rather than an assemblage of parts. That perception, in turn, can foster a more memorable and meaningful experience for a person observing and using the plaza. In spite of its significant role in the perception of a plaza, little has been written on the subject of pavement except as a functional or decorative landscape element.

This thesis is an exploration of visual and perceptual connections across four scales: pavement, architecture, plaza, and context. Visual considerations include the geometric pattern of the pavement, forms and rhythms in adjacent architectural masses and facades, axes influencing movement through the space, and the plaza's physical setting. Perceptual factors include symbolism in ground plane forms and patterns, subtle messages in

architectural facades, the plaza's local identity or function, and the cultural or historical significance of the site.

A review of plazas worldwide revealed a concentration of design excellence, and related research interest, in the Italian piazza. Four of these plazas were selected as case studies based on the literature, in which they were described as having a timeless and universal appeal, sustained by their integration into a coherent whole. The paving design of each plaza appears to play an important supporting role in that integration; analysis and site visits confirmed this notion. Findings from the four case studies were distilled into plaza paving design guidelines that have the goal of integration. Although the case study pavements were designed in the 14th to 18th Centuries, the resulting guidelines may inform contemporary designers of pavement in plazas and other settings.

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CHAPTER ONE

INTRODUCTION

The details… make the product. The connections, the connections, the connections. It will in the end be these details that give the product its life.

(Charles Eames, architect, designer, and filmmaker, quoted in Makovsky, 2005)

Charles Eames was talking about furniture details in the quote above, but he applied this design philosophy to all of his work: the connections between the parts of a design are more important than the qualities of any single part in itself. His wife and design partner Ray had a similar take on the subject: "everything hangs on something else" (Makovsky, 2005, p. 78). Many designers have based their work on a central concept of connections between parts across a range of scales, from smallest detail to largest mass. In their best work, details are not trivial ingredients, embellishments, or afterthoughts; they are essential parts of a whole entity. This is the concept of integration as defined in this thesis.

Pavement is regarded as a detail of the urban scene, even though it's everywhere. Due to its practical, commonplace nature and its small modular scale, it may be dismissed as a purely functional or decorative element, or given a low priority in design decisions. However, it is central to this thesis that pavement can facilitate connections between the parts of a built environment, and to the person using that space. The environment chosen as a setting for this study is the urban public plaza, since its pavement is a visually dominant element and therefore plays a large part in its perception.

Some plazas are more coherent, memorable, and meaningful than others. The key to their impact appears to be the integration of all their parts into a whole, meaning that all of

the elements of the plaza seem necessary to the overall design and they support one another in visual and more intangible ways. The author has encountered plazas while traveling that left vivid and lasting impressions. This experience occurred more frequently in plazas that had a patterned pavement, in which the materials and patterns seemed to tie the space together, so it could be seen and understood as a whole. This led to the question of how a design element as humble as pavement could support that perception of integration. It also raised the question of why many other plazas, also with patterned pavements, gave the opposite impression – disjointed, chaotic, or meaningless.

Perception is personal and subjective. It can be a visual, intellectual, or emotional awareness of an environment, based on both tangible elements and their mental associations. A person's consciousness of any environment ranges from simply seeing or otherwise sensing it, to understanding it, emotionally responding to it, and deriving meaning from it (Bell, 1999). The perception of integration is doubly subjective, since each person might define integration differently, and perceive it in his or her individual way. The author's definition of integration is the gathering of parts into a coherent, unified whole in which every part is important, and the whole is greater than the sum of its parts. The author's personal experience of perceived integration is a recognition of links or connections between the parts of a whole, and the cooperation or dialogue between those parts.

Why is integration important? "A vivid and integrated physical setting, capable of producing a sharp image, plays a social role as well. It can furnish the raw material for the symbols and collective memories of group communication" (Lynch, 1960, p. 4). Integration has been a fundamental goal of design since ancient times, and it is more than simply a visual consideration. As designers, we are limited to creating tangible objects, but we may be able

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to enhance or facilitate the meaning derived from those objects. It is true that a public plaza may be loved for purely sentimental reasons, and that even an asphalt parking lot can be a beautiful place when it is hosting a busy farmer's market. But a plaza that has a quality of integration is not only more attractive, it may be more meaningful to those who use it. "A distinctive and legible environment not only offers security but also heightens the potential depth and intensity of human experience" (Lynch, 1960, p. 5). The goal of this study is to examine plazas that have a perceived quality of integration, and to examine their paving designs in order to see how they contribute to that perception.

The role of pavement

"The floor underfoot is a very immediate and personal kind of experience for pedestrians, but unfortunately, modern city builders have forgotten the visual and tactile qualities possible through the floor. It can be patterned, textured, colored, and thrown like a rich rug underfoot" (Halprin, 1963, p. 92). The role of detail is sometimes undervalued by modern designers, who may have the pedestrian in mind as an "audience" (implying their detachment from the scene) or a "user" who must be accommodated or moved through a space. The typical pedestrian pace and field of vision can make small-scale design elements very significant, particularly in the ground plane. Pavement that has been designed as an integrating element respects and engages the walker, involving them in the environment they pass through. "In a manner of speaking, and by no means all metaphorically, floors and pavements are the touchstones of a civilization" (Rudofsky, 1969, p. 276). Pavement is a detail of the larger urban picture, but it can be a very important one in certain settings. This is especially true of plazas, which are traditionally paved for a variety of practical reasons.

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Practicality is at the core of most pavement design literature today. The overall tone is decidedly conservative; pavement's functions, limitations, and realities, rather than its potential, are the basis for guidelines. Contextual considerations, or the possibility of adding meaning to a plaza through its ground plane form and surface, are rarely mentioned. Unfortunately, a typical attitude is that "paving is, when all is said and done, almost always no more than a background, and should not aggressively proclaim its presence" (Pinder & Pinder, 1990, p. 3). The apparent reaction to these guidelines by designers tends toward either rebellion or meek obedience, often resulting in over- or under-designed pavement.

Current literature related to plazas and pavement contains numerous references to the integrating or unifying nature of patterned pavements. However, it offers very little information on how that has been successfully achieved, or how a designer might approach a paving design with the goal of integration.

Scope and objectives of study

A case study methodology was employed in order to examine plazas that were described in the literature as integrated spaces. Preliminary literature review was directed toward selecting case studies and grounding a framework for their analysis. Plazas were sought with the following characteristics:

- a recognized level of excellence in their design;
- a perceived quality of integration; and
- a patterned pavement.

As it happened, those qualities were mentioned most frequently in references to Italian piazzas, especially from the 14th to 18th Centuries. Four piazzas repeatedly surfaced in the literature, often with descriptions of the pavement as a unifying or integrating element.

They were the Piazza del Campo in Siena, Piazza Pio II in Pienza, Piazza del Campidoglio in Rome, and Piazza San Marco in Venice. These four plazas were selected as case studies.

Although these plazas are widely recognized as valuable design models, the time and place of their design is worth noting. Historic precedents often illustrate, by virtue of their survival and continued popularity, what design qualities have lasting appeal and meaning (Leupen et al., 1997). However, in order to make this study more relevant to contemporary design, the pavements of modern plazas are examined in Chapter Five, with the intentions of: 1) illustrating the design principles extracted from the case studies, and 2) testing the transferability of the resulting guidelines.

An interdisciplinary approach was undertaken to the literature review, borrowing from the fields of urban design, landscape architecture, architecture, and interior design. Pavement and floor design texts were principal sources. The plaza as a traditional urban form was examined with the intent of understanding how the spatial qualities of that environment contribute to its image and experience. Psychology, phenomenology, and other qualitative fields of literature were explored to inform the subjective judgments required of the case study analysis, and to add some depth to the resulting design guidelines. Prevalent ideas from this period of Italian history, and their reflections in architecture, landscape architecture, and urban design, were also investigated.

A theoretical framework, based on the author's personal views but grounded in the literature, structures the case study analysis. The foundation of this framework, presented in Chapter Three, is the concept that the pavement of integrated plazas carries patterns, themes, or symbols that are paralleled in other elements of the plaza. Each element relates to the others in a way that enables a clear visual and mental perception of the whole rather than its

constituent parts. For the purpose of analysis, the elements of each case study were sorted according to their physical scale: pavement, architecture, plaza, and context. Formal and perceptual connections between elements at different scales were noted. Whether a person is designing, experiencing, or analyzing a built environment, scale relationships play an important role. "Scale linking, or working across scales, suggests standing back and using a wider lens to detect exactly how the larger acts on the smaller and how small scale comes into harmony with large scale" (Benzel, 1998, p. 20).

The objective of this study is to analyze these four case studies in their contexts and to draw conclusions from their designs that could serve as the basis for pavement design guidelines. Since the research question is related to the integrating capacity of a plaza's pavement, that will be the driving concept in the analysis and in the resulting guidelines. Relationships between the pavement and other elements of each plaza are as important as the design of the pavement itself. The intent is to produce guidelines that might help a person design a pavement that is more than just functional and attractive, but an integral part of the whole plaza, and an active element in supporting the perception of integration.

This study is based on two premises: 1) that pavement plays an important role in the perceived integration of a plaza, and 2) that integration can deepen the experience of a place by enabling it to be seen as a whole. The following chapter is a summary of the literature that contributed to those conclusions, which in turn defined a hypothetical framework to be described in Chapter Three. That framework guided the case study analysis in Chapter Four, the findings of which were distilled into pavement design guidelines in Chapter Five.

CHAPTER TWO

LITERATURE REVIEW

As in many research projects, the author's personal outlook and interests influenced the literature review and the paths it took. Three concepts were pursued from the beginning, and their interrelationships were gradually recognized and incorporated into a theoretical stance. Those concepts were:

- integration as a design principle, and a desirable quality of public space;

- scale relationships between design elements, especially from detail to whole; and

- pavement as a potentially meaningful component of urban settings.

Certain texts that addressed relationships between integration and scale were important to this literature review. Their authors tend to cross disciplinary boundaries to explore human experience and perception of the built environment. Two that were particularly influential are worth noting: Christopher Alexander and Katherine Benzel.

Christopher Alexander's works (Alexander et al., 1977, 1987; Alexander, 1993, 2002) are concerned with integration or wholeness as a central principle of design at any scale, and particularly in relating the smaller parts to the larger whole. His work with colleagues in *A Pattern Language* sought universal, archetypal solutions to design problems at a wide range of scales, by analyzing successful outcomes (Alexander et al., 1977). In more recent and independent work, he attempts to analyze wholeness as if it were "a real structure, an actual 'thing' in itself" rather than an intangible or mystical quality (Alexander, 2002, p. 90). His concept of wholeness is similar to the author's definition of integration.

Katherine Benzel's *The Room in Context* (Benzel, 1998) approaches the problem of designing an interior room as one of connecting it to the building, the landscape, and the city.

She encourages all environmental designers to "look beyond their traditional boundaries" and to examine each design in terms of "the continuity between itself and its total surroundings" (Benzel, 1998, p. 5). Her concepts of "integrated design" and "scale linking" (Benzel, 1998, p. 19) helped to shape the theoretical framework described in the next chapter.

More specific to the topic area of this study, two authors shared a more holistic view of paving design that was in stark contrast to many other texts on the subject. Kim Williams (1997, 2000) investigates historic Italian pavements, mainly in indoor settings, and analyzes each as a "two-dimensional map of a three-dimensional space" (2000, p. 87). Her concept of floor patterns as revealing the spatial structures and experiential qualities of buildings contributed to the ideas behind this thesis. Nikos Salingaros (1999a, 1999b, 2000) criticizes the emptiness of modern urban space, including its pavement, because it does not relate to human scale or mental processes. He and his colleagues propose that pavement can act as "a vehicle for conveying meaning" if its pattern contains several levels of scale linked hierarchically in the manner of a fractal structure, which relates it to the natural structure of our minds (Mikiten et al., 2000, p. 63).

The focus of this study is to discover how a paving design can support the perception of integration in the eyes and mind of a pedestrian in a public plaza. The physical scale and practical nature of pavement suggests a relatively narrow field of vision and a short focal length, which is reflected in much of the literature on the subject. The goal of the literature review in this chapter is to zoom out and pan the camera, so to speak, in order to examine the relationships between pavement and its surroundings.

Integration and scale relationships

Many of the authors encountered in the literature appear to use the verbs "integrate" and "unify" interchangeably. The distinction between the two words is not important, but the word used consistently in this thesis is integration. The author's definition of integration, again, is the gathering of parts into a coherent, unified whole in which every part is important, and the whole is greater than the sum of its parts.

Integration does not mean uniformity, sameness, or homogeneity. For example, buildings with very distinct styles and materials can be seen as integrated if they share some common elements (e.g., proportions or rhythms), if their scales are compatible, and if they have similar relationships to the street or plaza they face (Carmona et al., 2003; Hale, 1994). A third element, such as pavement, can support the perceptual connection between two buildings by spanning the ground plane between them and clarifying their relationship.

Integration is a fundamental goal of any type of design (Alexander, 2002; Arnheim, 1988; Dee, 2001). As a larger concept of ecology, society, and art, integration is universally understood and desired. It may be an especially important design principle in the built environment because of the relative permanence of buildings and landscapes, and may be a measure of their success. People are drawn to environments that they can see and feel as a whole entity, and may be confused or repelled by disjointed, chaotic environments (Kaplan et al., 1998; Lynch, 1960; Rapoport and Hawkes, 1970; Rapoport, 1977). Tangible or designed elements are only a part of the whole effect, but they can have a strong influence on an observer's state of mind and their reaction to an environment. In a plaza or town square, for instance, "specific visual and kinesthetic relations will decide whether a square is a hole or a whole" (Zucker, 1970, p. 3).

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Integration of a plaza with its contextual surroundings enriches both. Alexander et al. (1977) caution that their "pattern language" can be "a medium for prose, or a medium for poetry" (p. xli), the difference depending in part on the degree of integration among the patterns and with their context. "When you build a thing you cannot merely build that thing in isolation, but must also repair the world around it, and within it, so that the larger world at that one place becomes more coherent, and more whole" (Alexander et al., 1977, p. xiii). Designing environments as if they were independent entities disconnects them from their context, and diminishes the potential meaning of both. "We are able to see and read a word alone without its context, but what counts is the meaning a particular word has in the structure of the work… surrounding words joined together in patterns of construction support and unfold the meaning of a text" (Benzel, 1998, p. 16).

Integration can function as an aid to understanding complex environments such as plazas. There is a crucial balance point between making sense of a place (understanding its order) and being involved or engaged with it (appreciating its complexity). An emphasis on either can take away from the other. Predictability is comfortable, but boring; chaos is unsettling, but interesting. Order and complexity are the two most important qualities to be considered and balanced in built environments (Foster, 1974; Kaplan and Kaplan, 1998; Lynch, 1960, 1981; Rapoport and Hawkes, 1970; Rapoport, 1977). These are important factors at all scales of design. Cities, for example, are "problems in organized complexity – organisms that are replete with unexamined, but obviously intricately interconnected, and surely understandable, relationships" (Jacobs, 1961, p. 438). However, the lessons learned at that scale, as in Lynch's famous study *The Image of the City* (1960), do not necessarily apply

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to the scale of a plaza. "One is a matter of cognition, the other of perception; at larger scale

clarity is needed, at smaller – complexity" (Rapoport, 1977, p. 207).

Scale is an important component of visual integration, and another factor in the

order/complexity balance. Our reading of a design can be affected by the number of

perceptible scales contained in it, and the relationships between those scale levels.

Salingaros (1999b, 2000) believes that our brains are structured in a way that attracts us to

objects that are similarly organized. "Confronted with a man-made object or structure, we

grasp all the different scales at once, automatically establishing a scaling hierarchy… If the

scales are spaced the same way as in natural structures, and if they also correlate with each

other, we perceive the structure as a coherent whole" (Salingaros, 2000, p. 227). Alexander

(1993, 2002) and Gombrich (1979) also note hierarchal scale relationships in both natural

and designed patterns, many of which have a fractal structure similar to that recommended

by Mikiten et al. (2000) for pavement design.

The overlapping fields of landscape architecture and urban design can be approached

from many viewpoints and levels of scale, from a broad and abstracted overview to a close

analysis of small elements and processes. At each level of scale, the view might be

dominated by either physical forms or abstract meanings. The city as a whole may be seen as

a street network by one specialist, or as a community by another. A plaza could be seen as

masses and volumes by an architect, or an expression of local ideology by an artist. Design

details such as pavement might be seen as surface ornamentation, or a medium of

communication. Returning to the camera lens analogy, designers sometimes set their lens at

a certain focal length or level of scale. This may come from their personal traits or habits, as

a result of their design education, or owing to their area of specialization. "When we focus

on a single scale, we miss the opportunity to consider multifaceted problems in the environment in a unified way" (Benzel, 1998, p. 20). It is difficult to perceive integration, much less to design it, without taking a wide perspective that incorporates many levels of scale and recognizes the relationships between those levels.

Plaza design

Plazas, sometimes referred to as squares, are an ancient form of public space. "The square was probably the first organizing form of urban space and the street was an extension of the square once the periphery had been filled with houses" (Trancik, 1986, p. 67). Once the center of daily public life, the forms and functions of plazas have adapted to cultural and economic realities (Chidister, 1999; Cooper Marcus and Francis, 1990; Zucker, 1970). Renewed interest in their modern counterparts, however, indicates that they may be more important than ever. Plazas continue to serve their traditional purpose: to provide a public place for people to gather, do business, relax, and watch other people. They also have the potential to be powerful statements of a city's history, identity, and values. In the worst cases, they may be seen as bleak and pointless wastes of urban space and taxpayers' money.

In the larger urban spatial picture, a plaza is "a conceptual anchor point" or a node of activity, often at the intersection of major pedestrian routes (Lynch, 1960, p. 102). It may also serve as a landmark. Its connection to the street and to other nodes in the urban network are important factors in its success or failure (Trancik, 1986; Whyte, 1980). The nearby presence of mixed land uses and residences are basic requirements of urban vitality in plazas and other public spaces (Jacobs, 1961; Trancik, 1986). These factors can support the use of a plaza for more than just special events or weekday lunch hours, which is when many plazas see their heaviest use (Whyte, 1980).

Plazas are distinguished from urban parks in two ways: 1) plazas are generally paved in order to support heavy periodic use that could destroy turf or other low-growing vegetation that is typical of parks (Zucker, 1970); 2) perceptually, a plaza is not generally seen as a refuge or escape from the city, but an integral part of it (Carr et al., 1992; French, 1978; Zucker, 1970). Plazas are one of the most intensely researched and designed components of the broader "space between buildings" that constitutes the public realm (Carmona et al., 2003; Cooper Marcus et al., 1990; Gehl, 1987; Webb, 1990; Zucker, 1970).

There is an important social and political dimension to public space that underlines its symbolic importance. "The public realm is the physical manifestation of the common good. When you degrade the public realm, as we have, you degrade the common good, and hence you impair the ability of a group of people incorporated as a republic to think about the public interest" (Kunstler, 1995, p. 21). A privately-owned, indoor shopping mall is not an appropriate substitute for a public plaza (Brill, 1989; Chidister, 1989). As modern citizens spend more time in their homes, offices, or in virtual space, urban public space becomes more essential, rather than less (Carmona et al., 2003; Kunstler, 1995).

The number of people who use a plaza isn't necessarily a measure of how good its physical design is; it has more to do with the motivations of people to go to the plaza, which are largely driven by its location, activities, and services available, such as food or drink (Whyte, 1980). The sight of other people, engaged in programmed or spontaneous activities, is a more powerful draw than any designed element (Moughtin, 2003; Whyte, 1980). In that sense, the popularity of a plaza is self-reinforcing; people are drawn to people.

There is some agreement on the optimal dimensions of plazas, based on the maximum distance at which a face can be recognized, roughly 75 to 100 feet (Alexander et al., 1977;

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Lynch, 1981; Moughtin, 2003). Another approach is to make the width of the plaza between two and three times the height of its major building (Sitte, 1945; Hegemann and Peets, 1988; Duany et al., 2003). Perhaps the best rule for sizing, although the least specific, came from Vitruvius in the 1st Century: "it should be proportionate to the number of inhabitants, so that it may not be too small a space to be useful, nor look like a desert waste for lack of population" (quoted in Moughtin, 2003, p. 87).

Wide fluctuations in activity are part of the nature of plazas; they may be filled to capacity for a special event and practically empty at other times. They can look bleak and desolate when they're not occupied, but a pattern in the ground plane can offset that impression. "By visually breaking down large areas into more manageable bits, paving patterns help to 'occupy' an area and render it more approachable" (Specter, 1974, p. 31).

Enclosure is considered a critical ingredient of a plaza (Moughtin, 2003; Sitte, 1945; Webb, 1990; Zucker, 1970) because it "embodies the idea of Hereness… no sooner do we create a Here than we have to admit a There, and it is precisely in the manipulation of these two spatial concepts that a large part of urban drama arises" (Cullen, 1961, pp. 29, 182). Enclosure may enable a "sense of place" because it differentiates inside from outside, and the impression of being inside is fundamental to a sense of place (Carmona et al., 2003; Duany et al., 2003; Lynch, 1981; Norberg-Schulz, 1971). Perceptually, enclosure creates a frame around outdoor space that turns it into centripetal or positive space, as opposed to poorly defined centrifugal or negative space (Alexander et al., 1977; Ashihara, 1970; Trancik, 1986; Zucker, 1970). On a practical note, the microclimatic benefits of enclosure can be especially important in Northern climates (Gehl, 1987; Whyte, 1980).

The concept of a plaza as an "outdoor room" is prevalent in the literature (Benzel, 1998; Cullen, 1961; Mayernik, 2003; Moughtin, 1995, 2003; Pregill and Volkman, 1999). The configuration and appearance of buildings facades that surround a plaza, particularly at their ground floor levels, have important functional and aesthetic effects (Carmona et al., 2003; Waite, 1998). "One practically wants to find oneself in a beautiful room, one of whose walls is formed by the principal building" (Hegemann and Peets, 1998, p. 27). Like the quality of enclosure described above, this is difficult to achieve in contemporary urban space because it is relatively discontinuous, and buildings tend to be "freestanding sculptural objects" with little "distinction between front and back" (Carmona et al., 2003, p. 68).

Trees and vegetation, besides offering relief from the urban hardscape, are another potential means of enclosing a plaza. Trees can also have the effect of lowering the plaza's perceived roof, if it sits between tall buildings. Unfortunately, many modern plazas are constructed over parking garages or other underground structures. The weight and moisture restrictions of these plazas often preclude the possibility of trees, as well as making thinner, lighter paving materials necessary (Koerber et al., 1997). Although trees are often used as vertical design elements throughout a plaza, Whyte believes that they "ought to be related much more closely to sitting spaces than they usually are" (1980, p. 46). This would indicate edge placement in most cases, as noted below.

A plaza's edges tend to be preferred for sitting, viewing the plaza, and feeling somewhat protected (Alexander et al., 1977; Carmona et al., 2003; Waite, 1998; Whyte, 1980). "If the edge fails, then the space never becomes lively" (Alexander et al., 1977, p. 600). Alexander encouraged the placement of "something roughly in the middle" of a public space because in effect it creates another edge, provides another place to sit, and generates a

sort of force field around it that engages people in the space (Alexander et al., 1977, p. 606). Sitte, on the other hand, believed that the center of a square should be free of obstructions, although he admitted that off-center placement might be justifiable (Sitte, 1945).

After measuring many variables of plaza use in New York, Whyte came to the simple conclusion that "people tend to sit most where there are places to sit" (1988, p. 110), and that moveable seats or a choice of seating locations in sun or shade will encourage plaza use. Gehl noted that "necessary activities" such as going to work will bring people through a plaza, but "optional" and "social activities," such as staying simply to watch other people, will only take place in public space when the conditions support them (Gehl, 1987, p. 12).

Many designers recognize the Italian piazza as a model of excellence. The piazza is "far more than so many square feet of open space; it is a way of life, a concept of living. Indeed, it might be said that the Italians have the smallest bedrooms but the largest living rooms in Europe." (Kidder Smith, 1955, p. 47). The plaza as an "outdoor room" seems to have been perfected in Italy: "there is hardly any difference between indoor and outdoor space except for the existence or nonexistence of a roof; almost no trees are planted, and the outdoor floor is paved with beautiful patterns" (Ashihara, 1970, p. 16). Italian Renaissance concepts of the ideal city (Figure 2-1) placed a special significance on plazas as spatial frames for viewing important buildings.

Figure 2-1. *Ideal City,* c. 1470, attributed to Piero della Francesca. (from www.wga.hu)

Not every aspect of the Italian piazza can be translated into a modern American setting. "San Francisco is not Siena, and it is foolish to evoke historic forms in the hope that they will [bring to America] the rich diversity of public life generated in the dense, highly centralized medieval city" (Cooper Marcus et al., 1990, p. 2). The historic piazza is widely recognized as worthy of study for its high quality of spatial design and detailing. However, it is important to remember that its original occupants were dependent on each other, and on the piazza, in a way that is quite foreign to our current social and urban structure (Brill, 1989; Carr et al., 1992; Chidister, 1989; Rowe, 1997). Another important aspect of the Italian piazza that can't be imported into another context is the Mediterranean climate, although Gehl (1987) has translated some of its design principles to northern climates. One of the most important and widely noted characteristics of the piazza, however, is potentially transferable – the sense of integration. The four case studies share that quality.

Historic overviews, precedent studies, and analyses encountered in the literature review were a rich source of information about the range of perceptions of plazas, especially the four that were chosen as case studies. Architects, historians, critics, urban designers, and landscape architects took quantitative approaches to the analysis of a plaza's form, and often added a qualitative layer of their personal interpretations of meaning (Ackerman, 1961; Baker, 1989; Bacon, 1967; Mack, 1987; Mayernik, 2003; Pieper, 1986; Trancik, 1986). The fact that many Italian piazzas are tourist destinations in themselves indicates that their appeal is not limited to design professionals and academics. In order to balance the specialist viewpoint of the literature, Internet searches yielded popular opinions of these plazas in personal vacation weblogs and other travel-related websites. They were not radically different from the expert view.

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Pavement

Texts relevant to paving design tend to fall at two ends of the bookshelf. On one end are idealistic urban design texts from the 1960s and 70s, many of which complain about the poverty of modern pavements. They provide very little useful advice but offer many photos of beautiful pavements, generally in foreign and historical settings, with brief and wistful texts (Halprin, 1963; Rasmussen, 1959; Rudofsky, 1969; Specter, 1974). On the other end of the shelf are practical manuals of construction details, standard laying patterns, and basic design principles (Beazley, 1960; Blanc, 1996; Littlewood, 1993; Pinder & Pinder 1990).

There is a large gap between those two groups of literature, noted also by Williams (1997). That gap is not filled by landscape architecture and design texts, some of which contain pavement design guidelines (Booth, 1983; Harris and Dines, 1998; Kirkwood, 1999; Moughtin, 1995, 2003; Watson, 2003). Those guidelines appear to be rooted in modern design theory, tending to emphasize functional and programmatic aspects over aesthetic considerations, which are briefly addressed by a review of formal design principles such as balance, repetition, and so on. Visual or meaningful connections between a pavement and its context are very broadly summarized, if at all. All of these texts fall somewhat short as guidebooks for a designer who wants to make the paved surface of a built environment an integral, or integrating, part of the whole design.

Many of the current guidelines and classifications of pavement appear to be derived, or even quoted verbatim without credit, from Beazley (1960). The functions of pavement as summarized by Beazley (1960), and repeated by Pinder and Pinder (1990) in an update of Beazley's work, are paraphrased here:

- practicalities: to provide a hard, dry, non-slippery, load-bearing surface

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- direction: to guide or restrict pedestrian traffic flows

- repose: to encourage slowing or stopping, with non-directional pattern

- hazard: to communicate non-verbal warnings of danger to the pedestrian

- scale: to reduce the scale of urban space to human proportions

- use: to indicate ownership or appropriate activity

- character: to reinforce the existing visual style of a space

This list of functions rather narrowly defines pavement's purposes, and simultaneously gives some vague indications of its potential (for instance, "character" is covered in three paragraphs that mainly describe paving materials). However, they have value as a foundation for an expanded view of pavement's possibilities. In fairness to Ms. Beazley (1960), she points to Piazza San Marco, one of the case studies to follow, as an exception to certain of her rules.

There are many ways of looking at pavement that go beyond a practical or functionalist view. Recurring themes in the literature, some of which overlap with the functions listed above, include the following potential roles of pavement:

- as a human scale element in large spaces

- as a stimulus of multiple senses

- as a cue to movement

- as pattern for pattern's sake

- as a carrier of information and meaning

- as a permanent landscape feature

- as an expression of the earth beneath it

- as a unifying or integrating element

A human scale element in large spaces: Modern urban space is often overscaled to the point of psychological discomfort (Sitte, 1945; Trancik, 1986). Ground plane patterns can perceptually reduce (or increase, if desirable) the expanse of a plaza. "The pattern of lines and geometric shapes and the changes of color as well as of texture provides a scale against which the pedestrian measures his movement" (Specter, 1974, p. 31). In a truly oversized or poorly defined plaza, "a strong pavement pattern might assist in the illusion of a manageable scale, but is unlikely in itself to correct the spatial illusion" (Kostof, 1992, p. 127). Mikiten et al. (2000) have developed a set of design guidelines for pavement based on the concept of multiple scales that "connect hierarchically" in the way the human brain does, relating people to a space in ways that modern architecture often can't (p. 63).
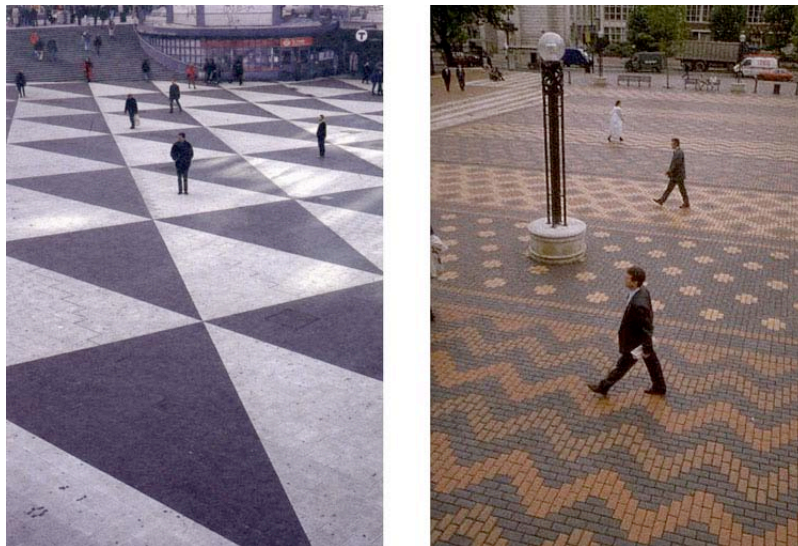
Figure 2-2. At left, a rather inhumanly scaled paving design, Stockholm, Sweden (from Topos, 2002); at right, human-scale paving, Birmingham, England (from www.corbis.com, ©ART on FILE/CORBIS).

A stimulus of multiple senses: Pavement serves as the floorscape or carpet of a city, and it is more than simply a visual element (Cullen, 1961; Crowhurst Lennard, 1995; Halprin, 1963). A "carefully constructed floorscape can also be a work of art that increases the pedestrian's enjoyment and awareness of the experience of walking… the effect, as in a

Zen garden, is to focus attention of the present moment, the immediate sensory experience, the feel of the paving underfoot, the changing materials, the visual pattern. This intensification of one's awareness of 'being here' in a pleasing environment intensifies one's sense of well-being" (Crowhurst Lennard, 1995, p. 38). Pavement may be our only physical contact with an urban space; its materials affect the sounds our footsteps make, and "much of our experience of texture comes through our feet" (Carmona et al, 2003, p. 87). "One can distinguish between soft and hard, smooth and rough; among grass, moss, stone, concrete, cobbles, pebbles, sand, mud, or boarding" (Rapoport, 1977, p. 187). Some paving materials even have distinctive smells in changing heat and moisture conditions. "Generally, however, urban perception and design still tend to be discussed in purely visual terms… occasionally paving is mentioned although even it tends to be treated visually" (Rapoport, 1977, p. 191).
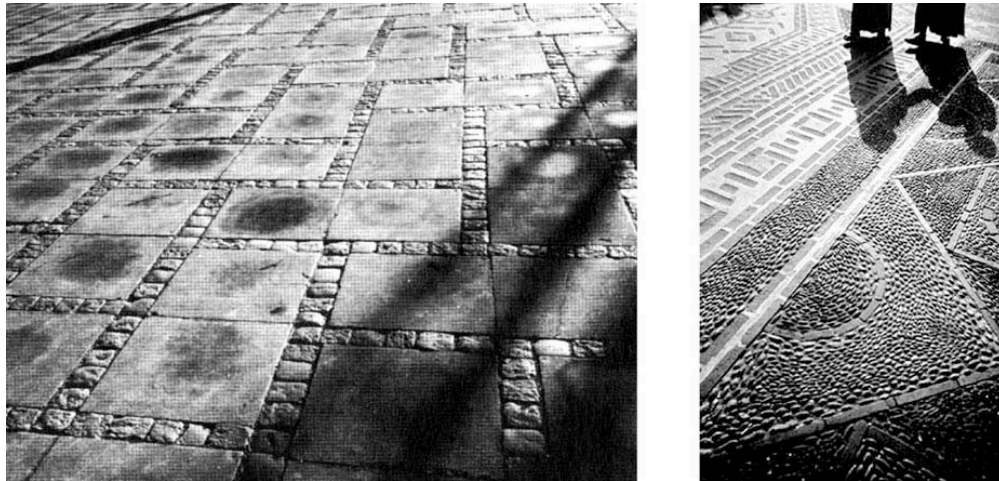
Figure 2-3. Pavements with tactile as well as visual interest: at left, Copenhagen, Denmark (from Specter, 1974); at right, Tetuán, Morocco. (from Rudofsky, 1969)

A cue to movement: "Patterns organize and frame movement and activity on a ground surface" (Kirkwood, 1999, p. 26). As mentioned in Beazley's list of functions above, the directionality and scale of a paving pattern can influence route and pace (Beazley, 1960; Cooper Marcus, 1990; Dee, 2001; Halprin, 1963; Moughtin, 2003; Rudofsky, 1969).

Virtually all of the literature relating to pavement design mentioned this capacity, often emphasizing it as if it were the most important consideration. It might be appropriate in a very complex plaza to indicate pedestrian "desire lines" (Watson, 2003, p. 6.8-10) if, for example, routes crossing the plaza aren't visible, or if the placement of furniture or other elements doesn't clearly indicate traffic paths. In many cases, however, directional patterns could unintentionally send the message to move on, rather than encouraging a person to stay in the plaza. In order to function as a cue, the pattern does not need to be particularly eye-catching; in fact, the visual effect of ground pattern may be exaggerated by movement across it. Rodemann (1999) described the negative health effects of certain interior floors due to the combined effects of movement and bold, repetitive floor patterns.

Figure 2-4. At left, offset joints in the paving stones of a London sidewalk subtly reinforce the direction of travel; at right, a retouched photo for comparison. (author, retouched by author)

Pattern for pattern's sake: Patterns are a way of visually and mentally organizing information so we can filter and process it (Bell, 1999; Dee, 2001; Gombrich, 1979; Hale, 1994; Salingaros, 1999a, 2000). They can also give our minds an opportunity to play games, such as completing or collecting patterns (Hildebrand, 1999; Hale, 1994). Patterns that are made up of smaller-scale, nested patterns are particularly satisfying (Alexander, 2002; Gombrich, 1979; Hildebrand, 1999; Salingaros, 2000). Large-scale, monotonous pattern is

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quickly filtered out and dismissed as redundant information, but "violated expectations" or surprises, such as a progressive or sudden change in pattern, can engage a person in a space (Rapoport & Hawkes, 1970, p. 108). Referring to the pavement sketches in Figure 2-5, Gombrich (1979) encourages the design of surface patterns "between these extremes of confusion and monotony; the one will send the 'break-spotter' spinning, the other will perhaps cause it to switch off" (p. 126).
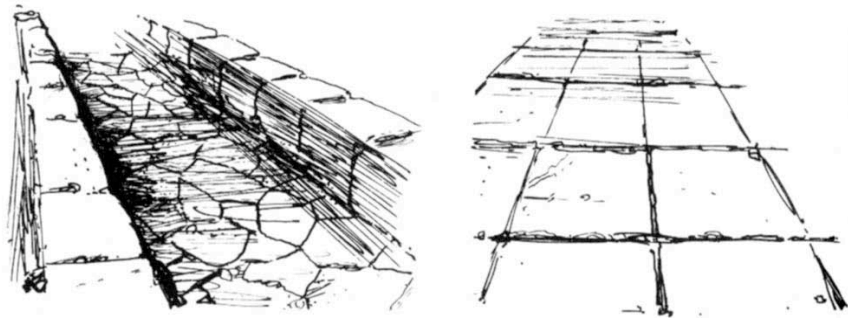
Figure 2-5. Variety without pattern (left) and monotonous pattern (right). (from Gombrich, 1979)

A carrier of information and meaning: Research on eye movements of pedestrians in streets reveals "middle distance scanning left and right" (Rapoport, 1977, p. 184). However, in plazas researchers observe "a focus of attention on a narrow band… with primary attention on foreground and middle ground" (Rapoport, 1977, p. 184). If a primary goal of a plaza design is to involve people in their environment, "an incredible opportunity to connect the pedestrian to the pavement has been missed all around the world, by using plain, featureless surfaces" (Salingaros, 1999b, p. 9). As mentioned previously, subtle cues in a paving design can provide functional information such as hazards or boundaries (Beazley, 1960; Halprin, 1963; Moughtin, 2003). We may also be influenced by paving patterns in ways that were not intended by the designer. Hill (1984) mentions a study in which diagonal lines on a sidewalk caused pedestrians to cross to the left side for no other apparent reason. Lakeman (1992)

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describes subconscious "tracking" along pavement lines and shadows as an absent-minded pleasure (p. 89). Whether or not we are conscious of how we respond to an environment, we are constantly filtering the sensory input we receive from it and translating it into information or meaning. Alexander (2002) believes that we intuitively sense the degree of "wholeness" in any object – whether it is a teacup, a pavement, or a building – in direct correlation to how closely its structure is a "picture of the self" (Alexander, 2002, p. 325). By this he means that we see human qualities such as imperfection, potential, and growth outward from a center. Objects or places in which we recognize that structure are more likely to have meaning to us (Alexander, 2002).

Paving which is a picture of your self   *Paving with no meaning*
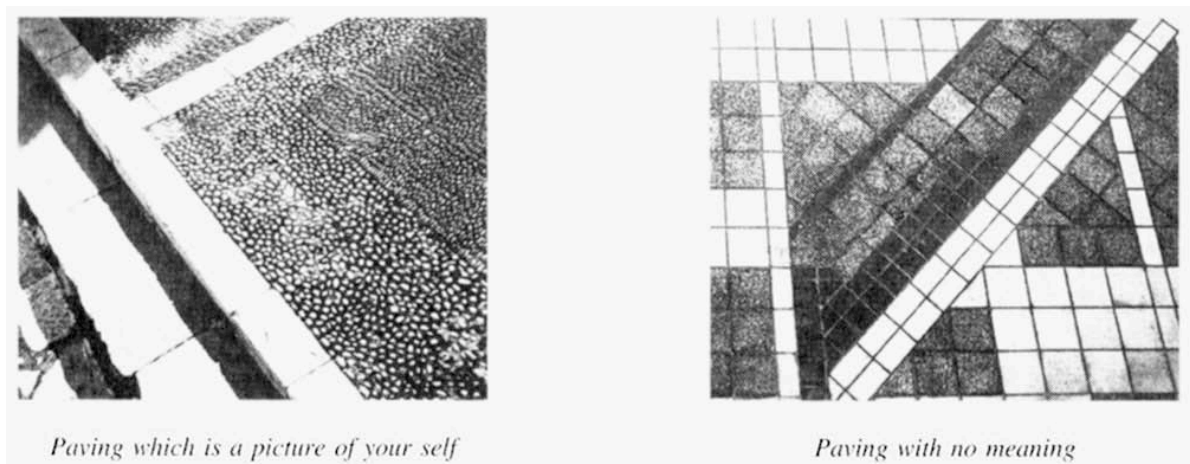
Figure 2-6. Pavements with and without meaning, according to Alexander's criteria. (from Alexander, 2002)

A permanent landscape feature: The pavement of a sidewalk or plaza may well outlive its buildings; this quality of durability can be reassuring in a changing environment. Norberg-Schulz describes a man who returned to his home town only to find that his childhood home was gone and the neighborhood so changed that he felt lost; "then he suddenly recognized the typical pavement of the sidewalk: the floor on which he had played as a child. And he experienced a strong feeling of having returned home" (Norberg-Schulz,

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1980, p. 21). As a plaza's architecture and use changes over time, the constancy of its pavement can offer a feeling of stability, especially if it has a patina that shows the signs of age, use, and long-term maintenance. It may even reflect the importance of public space to the citizens who use it. "A carefully detailed floorscape also expresses the values of the community who invest care and skill in the seemingly mundane floor of the city" (Crowhurst Lennard, 1995, p. 38).

Figure 2-7. A new path paved with old stone, leading to the Acropolis, Athens, Greece. (from Halprin, 1963)

An expression of the earth beneath it: Pavement can be experienced as "a thin veneer of durable material covering the most powerful and natural element in the urban scene: the earth's undulation" (Cullen, 1961, p. 128). Using materials that relate to local rock and soil types reinforces the perception of pavement as a natural surface, as do patterns that accentuate any slope or elevation changes in a plaza's ground plane. The inherent solidity of most paving materials, especially stone, gives them an impression of depth and connection to the earth. "A stony surface will seem heavy and more a part of the ground itself, whereas grass is lighter and is perceived as a light covering 'carpet'" (Thiis-Evensen, 1989, p. 39).

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Figure 2-8. Basalt paving with a natural appearance, Tokyo, Japan. (from *Elements and Total Concept,* 1990)

A unifying or integrating element: "Buildings, rich in texture and color, stand on the floor. If the floor is a smooth and flat expanse of grayish tarmac then the buildings will remain separate because the floor fails to intrigue the eye in the same way that the buildings do. One of the most powerful agents for unifying and joining the town is the floor" (Cullen, 1961, p. 53). Pavement can enhance buildings individually and as a group, by defining the positive space surrounding and between them (Ashihara, 1970; Moughtin, 1995). The pavement must also stand as an element in its own right. "It must be considered an equal partner with the buildings and by the nature of its levels, scale, texture and general propriety, produce the effect of sociability" (Cullen, 1961, p. 128). Some paving designs fail to integrate a space because they are too uniform, or too similar to their surroundings to have any real presence. In a plaza setting, "pavement can best function as a unifier when it possesses a distinct or unique pattern, making it easily recognized and remembered" (Booth,

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1983, p. 180). The sheer visual extent of pavement in a plaza gives it an important role. "Of significance, in terms of the detail design of the square or plaza, is a focus on the nature and extent of the ground surface as the main unifying element" (Kirkwood, 1999, p. 81). As large-scale unifiers, paving patterns and materials that are characteristic of a city can link a plaza to its context (Kirkwood, 1999).

Figure 2-9. Pavement that relates to adjacent architecture: at left, a building reflected in a curbside puddle in London, England. (courtesy of Johanna Neurath, from www.fotolog.net/pavement_pix)
At right, Wakefield, England. (from Williams, 2000)

The hypothetical framework derived from the preceding literature is described in the following chapter. In brief, it proposes that plazas that are perceived as integrated are characterized by visual and mental connections between their constituent parts. These connections, or links, can be seen crossing the scales from detail to whole in the manner of the "scale linking" described on page 6 of this document (Benzel, 1998, p. 19).

CHAPTER THREE

METHODOLOGY

The question addressed by this thesis is how the paving design of a plaza supports the perception of integration. A combined research method is employed to answer that question, and its primary strategy is the case study. The nature of the research question, and the historic period of the case study designs (14th-18th Centuries), suggest that qualitative and historical-interpretive methods are also indicated.

Case study strategy and sampling frame

A case study is the examination of a subject in relation to its context and the forces acting on it; cause and effect aren't attributed to specific factors, but causal links can be suggested (Groat and Wang, 2002). In this study, the links between physical design elements and the perception of their integration are the objects of inquiry. Case studies are most effective when the criteria for their analysis are derived from a hypothetical framework (Groat and Wang, 2002). The framework that developed from the literature review in the previous chapter is summarized on page 30.

An extensive and interdisciplinary literature review was the foundation for the case study descriptions and analyses. Multiple sources of evidence were used for two reasons: 1) to offer a range of personal perspectives and opinions other than the author's, and 2) to provide a body of data large enough to reveal patterns and consistencies. In the case study research strategy, an extensive data set needs to "converge in a triangulating fashion" on the object of inquiry (Groat and Wang, 2002, p. 346). The historic importance and continuing appeal of all four case study plazas was advantageous in that it provided a wide range of

literature to draw from. The author's analysis is merged with, and influenced by, previous work by design professionals and academics, as well as popular opinion.

The first criterion for the case study sampling frame was that the plazas were recognized in the literature as "best practices," or exemplary models, of design (Groat and Wang, 2002, p. 357). It was decided to restrict the sample to Italian piazzas after encountering many references to the piazza as a standard of excellence in plaza design (Ashihara, 1970; Broadbent, 1990; French, 1978; Fusch, 1994; Kostof, 1992; Webb, 1986; Zucker, 1970). This reduced the problems inherent to cross-cultural comparisons between case studies, but it could be argued that it compromises the transferability of the conclusions to contemporary design, as discussed in the limitations section of Chapter Six.

A perceived quality of integration was the second requirement for selection. References in the literature to integration, unity, or wholeness in certain plazas narrowed the list of potential case studies considerably. The third criterion was that the plaza had a patterned pavement, which was true of most of the remaining case study candidates.

Four case study plazas were selected following a "literal replication" logic (Groat and Wang, 2002, p. 357), meaning that their analyses were expected to have similar outcomes. They represent a range of plaza sizes and styles, and a variety of pavement designs. As mentioned previously, their major phases of design and construction occurred between the 14th and 18th Centuries.

Methods employed

All of the cases studies are well known and documented, which provided a broad range of descriptions and interpretations to draw from. Texts on the subjects of historic precedents, urban design principles, and individual architects were among the strongest

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sources. While many of the writings about the case study plazas mentioned their pavements, none were analyzed from the point of view of this study. Measured drawings, sketches, and photographs in these texts were studied to analyze the paving patterns and their relationships to other elements of the plazas. The historical periods of design and construction for each case study were researched in order to understand the ideological and cultural influences on urban design and architecture during those periods.

Site visits to each of the four case studies provided an opportunity for photography, personal experience, and interpretation. Notes and field sketches were made of pavement details such as joint materials, worn areas indicating movement paths, and other features that were not documented in the literature or visible in published photographs of the plazas. Direct observation of the people using these plazas was another benefit of the site visits, building on comments in the literature and previous observations made from photographs.

Framework for analysis

The author's understanding of three terms should be clarified in order to explain the hypothetical framework: they are perception, integration, and scale. As stated on page 1, perception can be a visual, intellectual, or emotional awareness of an environment, in response to both tangible elements and their mental associations. The physical components of a plaza (for example, its site, layout, structures, plant material, and pavement) are essentially the materials that a landscape architect or urban designer has to work with. A plaza's visual or sensory effects can be predicted or even simulated to some degree, and some intangible aspects such as the plaza's history or symbolic significance may be expressed in the design. However, personal perceptions of that plaza (for example, memories or emotions evoked by the place) are much more difficult to predict.

The subject of integration can be approached in a variety of ways, along a continuum from a purely visual quality to a mental state. Integration appears to function as a mediator between form and meaning, enabling a sort of crossover. In other words, if there is visual agreement between the parts of a design, there may be a corresponding clarity of meaning. In order to look for evidence of integration in the case study plazas, it was decided to look first at the whole plaza and then break it down into parts, which in this case are separated by levels of scale.

Scale in this sense refers to the physical dimensions of both natural and designed elements relevant to these plazas. It could also be described as the scope or focal length of the viewer, to return to the camera lens analogy from Chapter Two. Context, plaza, architecture, and pavement are the scales applied to this analysis. The scale levels could be visualized as a stack of layers as in Figure 3.1, each layer more or less including the one below it. The dark vertical threads represent the concept of integration, perceptually stitching together the layers. The paths taken by those threads are determined by the visual and perceptual connections between elements at various scale levels.
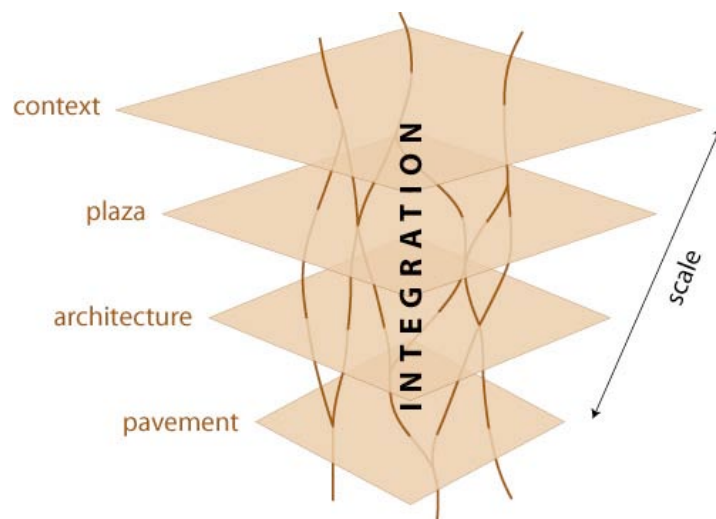
Figure 3-1. Diagram of the hypothetical framework for the study. (author)

Each case study in the following chapter is examined at each of the four scales, in terms of both visual forms and interpreted meanings, to find relationships, links, and connections across those scales. The intent is to discover how the parts contribute to the perceived integration of the whole. It could be argued that certain elements of these plazas might play more important roles than the pavement does. However, the object is not to quantify each element's contribution to the whole but to determine that it made a contribution. That determination is by necessity subjective and somewhat speculative.

The findings for each case study, particularly at the scale of the pavement, will be compared to the other three cases to find commonalities and contrasts. However, since the nature of the question driving the analysis is very place-specific, the emphasis is on findings within each of the four case studies rather than a comparison between them. Finally, those findings will be distilled into pavement design guidelines which have the specific goal of integration of the plaza.

In order to test the transferability of the guidelines to contemporary design, the pavements of some modern plazas are examined in Chapter Five. Although this study is not a critique of modern pavement in general, it could reveal some important differences in the approaches taken by modern designers.

CHAPTER FOUR

CASE STUDIES

The case study plazas were selected for their recognized excellence, their perceived integration, and their patterned pavements. All four are in Italy, ranging from roughly 42° to 45°N in latitude. All four are popular tourist destinations, and they are frequently analyzed by design professionals and academics as important historic precedents. Government buildings and museums are present on all four plazas, and two also have cathedrals. Restaurants, shops, and private residences are present to varying degrees. Their locations, relative sizes, and orientations are shown in Figure 4-1. In order of presentation in this chapter, they are:

- o Piazza del Campo, Siena
- o Piazza Pio II, Pienza
- o Piazza del Campidoglio, Rome
- o Piazza San Marco, Venice
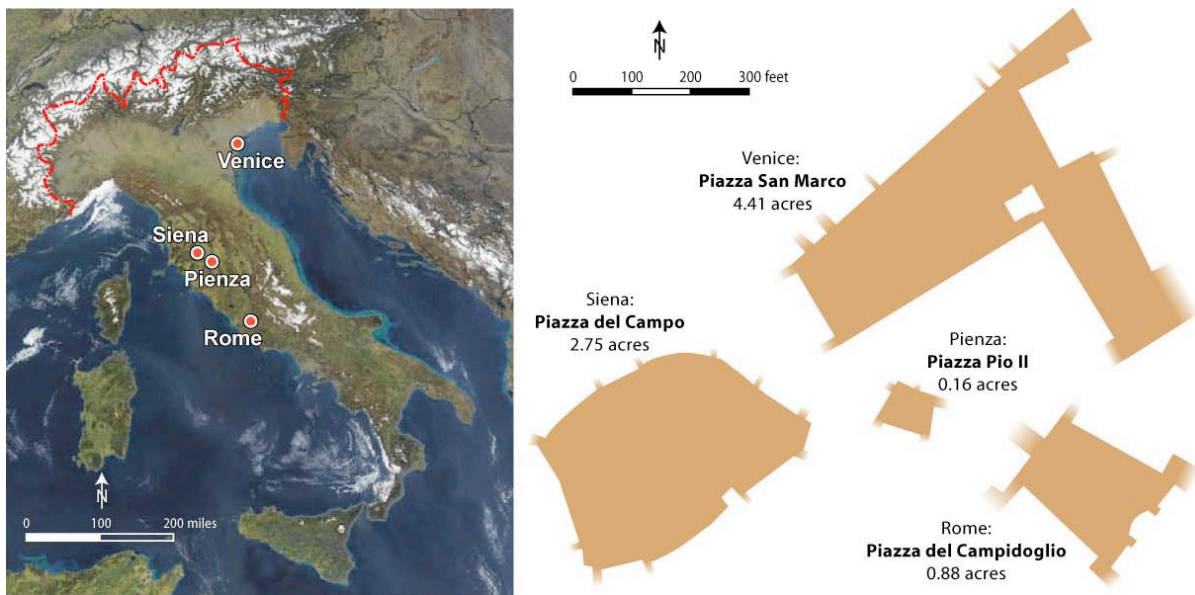
Figure 4-1. Left, the case study locations on a satellite image of Italy. (from http://visibleearth.nasa.gov; labels added by author) Right, the relative sizes and orientations of the four plazas. (author; data from Mann, 1993)

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As an overview, Figure 4-2 shows the dates of major phases of construction on the four plazas along a timeline of the 13th through 18th Centuries. All four of the plazas, and the historic city centers they occupy, are designated UNESCO World Heritage sites. In the case of Piazza San Marco, the entire city of Venice and its lagoon are registered (UNESCO, n.d.).
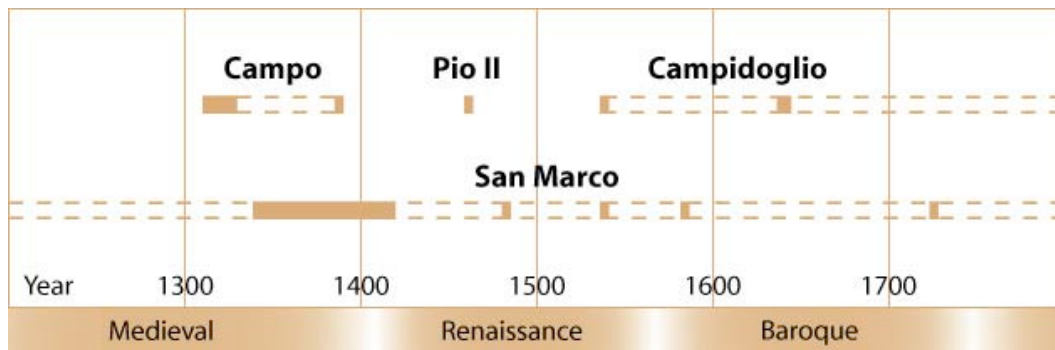
Figure 4-2. A timeline of architectural periods relative to the construction phases of the case studies.
(drawing by author; dates from Mann, 1993)

As is apparent from Figure 4-2, intermittent phases of construction kept the plazas evolving over long periods and through different stylistic phases. In the first three case studies, the pavement was designed, if not laid, near the beginning of the process. In the Piazza San Marco, a 13th-Century pavement was replaced by a different design in 1723.

Major influences on landscape architecture, urban design and architecture in Italy during the periods relevant to this study are summarized below. This synopsis is drawn from a range of writings (Baker, 1997; Fusch, 1994; Giedion, 1967; Hegemann and Peets, 1988; Heydenreich and Lotz, 1974; Kostof, 1992; Mann, 1993; Norberg-Schulz, 1965; Smith, 1992; Webb, 1990; Zucker, 1970).

The Medieval period was characterized by walled cities on defensive hilltop sites, expressive of the hard living conditions of the times. The idea of protection from the outside forces of nature and the enemy drove many practical design decisions and gave cities an introverted form and character. As the Church was practically the only patron of the arts,

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religious themes dominated public architecture, decoration, and painting. The irregular, picturesque qualities of Medieval Italian cities are admired by urban designers for their unity of expression and lack of self-consciousness. Some of those cities, like Siena, retained their Medieval style in part because they were so hard hit by the Black Plague in 1348. Development of Siena did not rebound for many years, so the city wasn't strongly affected by stylistic changes beginning in the Renaissance. Siena's Piazza del Campo was built just before the Plague hit that city and claimed perhaps two-thirds of its citizens.

The Renaissance began with the humanistic study of the classical languages, philosophy, and arts. With that study came the rediscovery and appreciation of ancient texts, such as Vitruvius' architectural writings from the 1st Century. New scientific discoveries and theories of perspective supported a view of cosmic order with man as its center and measure. There was a subtle shift away from a collective experience toward an individual one. A rational, methodical approach to design gave an orderliness to the architecture and urban design of this period. Typical elements of design were regular geometric shapes, axial symmetries, and simple proportions based on the human form. Even large public spaces were seen as balanced compositions, meant to be viewed from certain points. Leone Battista Alberti, a famous scholar and theoretician, published *De re aedificatoria* (On the art of building) in 1452. It was based on his interpretations of the principles proposed by Vitruvius, and became one of the most influential treatises of the time. The second case study in this chapter, Piazza Pio II, was influenced by Alberti's ideas and designed by one of his pupils.

Overlapping the late Renaissance and early Baroque was a style known as Mannerism, which was in many ways a rebellion against the static, perfect forms favored

during the Renaissance. Distortion, exaggeration, and ambiguity were exploited for emotional effect, or perhaps simply for the sake of imperfection. Rome's Piazza del Campidoglio has Renaissance, Mannerism, and Baroque elements in its design.

The Baroque brought a sense of energy and spatial flow to the urban scene. Public space often took the character of a stage set, with a dramatic sense of depth and movement through space rather than a composed equilibrium. The regular shapes of the Renaissance gave way to ovals, diagonals, and other irregular forms with more dynamic qualities. Long views connecting the parts of a city, or linking the city to its countryside, were popular devices for expressing an expanded sense of space. Venice's Piazza San Marco, although it evolved throughout the Medieval and Renaissance periods, was paved with its present design during the Baroque phase.

Piazza del Campo, Siena

The streets are narrow and winding and give no hint of the expansive piazza in their midst. Suddenly one turns a corner, glances down a dark tunneled staircase—at the bottom, in a bright patch of sunlight, figures pass to and fro across the opening. With curiosity one walks down the steps, and as one reaches the bottom the magnificent vista unfolds—colourful crowds in the expansive piazza, encircled by imposing crenellated palaces, and dominating the scene, the stately golden-stone Palazzo Pubblico with its soaring tower anchoring the azure sky. As one enters the vast arena the space encloses one warmly, with curving walls extending a welcome into the city's heart.

(from Crowhurst Lennard and Lennard, 1995, p. 34)

Siena's Piazza del Campo has been described as "one of the finest urban spaces in the world" (Broadbent, 1990, p. 29). Long admired and studied, it has "the richest, most stunning sense of space… It is a remarkable demonstration of how plaza shape and floor configuration can help offset the limited space-defining capacity of the buildings" (Hedman and Jaszewski, 1984, p. 79).

Context

The plaza site was formerly a grassy field (or *campo*) that probably served as a forum to the ancient Roman occupants of Siena (Webb, 1990). In later years, it became a common area to the towns occupying the three ridges that converge just northwest of the plaza (Figure 4-3). This natural saddle between the ridges was the site of fights, games, races, a market, and other activities (Rowe, 1997). As the three towns merged into one, a rather optimistic wall was built to contain the city, but Siena has still not filled that wall (Kostof, 1992).

The commune of Siena was ruled by the Council of Nine, a secular regime that took power in 1287 and lasted for nearly 70 years (Bowsky, 1981). The Nine, as they were locally known, drew up and enforced design ordinances that are credited with giving Siena a distinctive style in its streets, its architecture, and particularly in the Campo. These are some

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of the earliest examples of design regulations anywhere in the world (Zucker, 1970), and they

gave the Campo a certain designed appearance that is not typical of Medieval plazas.
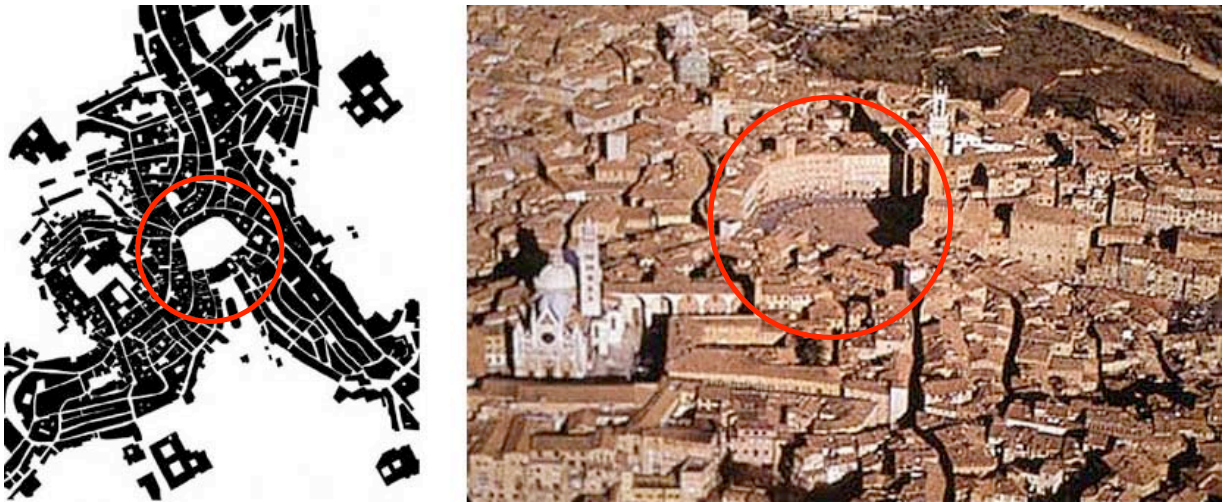
Figure 4-3. At left, a figure-ground study of present-day Siena, showing development along the three ridges that converge near the Campo at center. (from Ernst, n.d.) At right, an aerial photo of the cathedral (at left side of photo) and the Campo, looking northeast. (from http://www.cartage.org)

Plaza

Due to the Campo's high degree of enclosure, very little of the space is visible until

the plaza is actually entered. There are 11 entrances to the plaza, seven of which are along

the curving northern wall and offer glimpses of City Hall and its clock tower (Figure 4-4).

Of those seven, five pass through tunnels or arcades, increasing the contrast from dark to

light, and from compression to release, on entering the plaza. The entrances are barely

visible from inside the plaza, heightening the sense of enclosure and separation from the

outside. Since the Campo sits in a saddle, most of the northern entrances ramp or step down

into the plaza from a street that follows the ridge.

Figure 4-4. Five of the 11 entrances to the Campo, all revealing parts of City Hall. (author)

The Campo measures more than 250 by 350 feet, enormous by Medieval standards. It was designed to hold the entire population of Siena, which was roughly 50,000 before the onset of the Black Plague in 1348 (Bowsky, 1981). The floor is dished and sloping, falling about 15 feet from north to south (Broadbent, 1990). This adds to the sense of enclosure already established by the bounding architecture, and adds another dimension to the experience of crossing a plaza. In the "sunken floor" ground plane archetype, "the downward sloping floor exerts its own additional pull to that which the natural force of gravity exerts on our normal movements" (Thiis-Evensen, 1989, p. 75).

Figure 4-5. The Campo, facing south toward City Hall, or Palazzo Pubblico. (author)

The clock tower of City Hall (Figure 4-5) is even higher than that of the nearby cathedral, symbolizing the struggle between secular and religious powers within the city (Webb, 1990). Competition and animosity between cities during this period was an even stronger motivation for making important statements using public space. In the case of Siena's Campo, "civic pride was the spur, intensified with rivalry with the neighboring city-state of Florence" (Webb, 1990, p. 33).
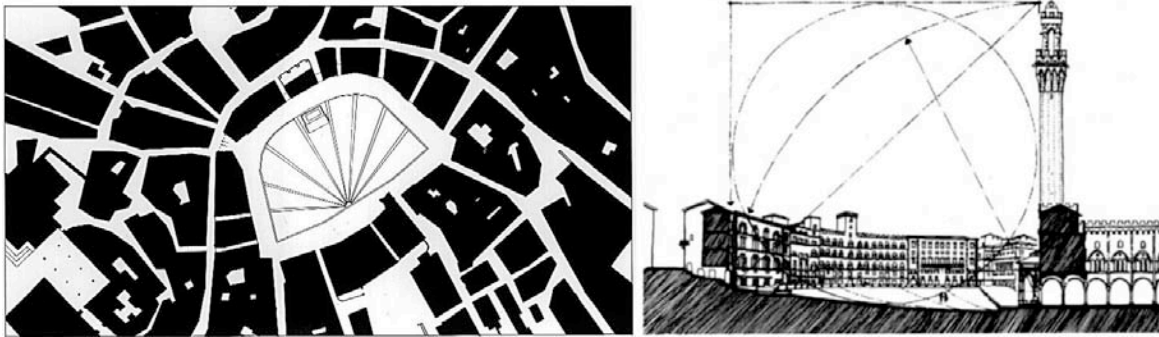
Figure 4-6. Left, a plan of the Campo (from CLRnet, n.d.); right, a section of the Campo, showing the relationship between the tower of City Hall and the volume of the plaza. (from Lakeman, 1994)

The verticality of City Hall's tower functions as a "tent pole" to lift the perceived ceiling of the space (Figure 4-6), effectively reducing the plaza's width to height ratio and defining the volume as a whole (Hedman and Jaszewski, 1984, p. 76). The tower also keeps City Hall from perceptually sinking into the lower side of the bowl (Thiis-Evensen, 1989).

The curvature of the surrounding streets and the bowl shape of the Campo are natural results of Siena's topography, but they have microclimatic benefits as well; the winding streets are protected from winter winds and summer sun. The southeastern orientation of the curving wall along the Campo's upslope side makes it an efficient suncatcher, and with the concave floor it "receives natural light as perfectly as any structured space" (Lakeman, 1992, p. 88). The reflected light is colored by the warm tones of the architecture and by the brick pavement (Lakeman, 1992).

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As was true of many Medieval hill towns, Siena's water has always been in short supply. A system of underground aqueducts, some of them 25 kilometers long, provided Siena's wells and fountains with water beginning in the 12th Century (Diana, n.d.). The scooping pavement of the Campo itself was a collector of rain water, and there were cisterns just under the pavement as well as grain storage vaults (Rowe, 1997). It may be significant that the lowest spot of the plaza, and the focal point of the paving pattern, is not the main entrance to City Hall but a drain framed in stone (see Figures 4-5 and 4-9).

Movement through the Campo is influenced by the combination of the downward slope of the central area and a level ring around its edges, where cafes and shops occupy the plaza's perimeter along the curving wall. A traditional horse race called the Palio is still held in the Campo twice every year, when the outer ring of pavement is covered with earth to provide traction for the horses, and the inner area is occupied by the spectators (Rowe, 1997). Bollards separate the two zones and provide places for standing and leaning in the manner described by Gehl (1987). People sit or lie on the open pavement, always facing downslope, as if it were still a grassy field (Figure 4-7).

Personal impressions of the site:

Intense sun on the Campo made heat rise from the pavement in waves, causing a mirage effect. People stayed under the umbrellas of the cafes and ate gelato, or crowded into the shadows of City Hall and the clock tower. Tour guides shouted in various languages, pointing out features of the piazza to dazed and sweaty tourists. Children ran down the sloping pavement along its gray lines, and then marched slowly up along the same lines. Repairs to the pavement added to its appeal – the newer stones and bricks made the older ones look ancient but cared for. The simplicity of this space was a relief after seeing the nearby cathedral, which has a façade that seems designed to intimidate a person looking up at it, and a beautiful but complex pavement.

Figure 4-7. Shadows on the Campo floor; roofline crenellations (left) and the tower's shadow (right). (author)

Architecture

The crenellated roofline of City Hall (see Fig. 4-5) is symbolic of Siena's historic

Ghibelline loyalty (to the Emperor rather than the Pope) and its opposition to Florence's

Guelph party. The crenellations cast interesting shadows on the pavement, forming

"impermanent lines on the Campo floor" that people may subconsciously follow when

crossing the plaza (Lakeman, 1992, p. 89). On a hot day, people naturally seek the shade of

City Hall and its clock tower (Figure 4-7).

The curving north wall of the Campo (Figure 4-8) is made up of linked buildings with

a more or less consistent height and style, as was dictated by the Council of Nine. Materials

and colors are varied, but brick and stucco in warm colors dominate. Even the window style

of these buildings was regulated by the Nine (Bowsky, 1981); many of them still have

Sienese Gothic arches like those on City Hall in figure 4-9. The continuity of these

buildings, and their deference to City Hall, can be seen to represent the "suppression of

individual interest in favor of the common good" (Mayernik, 2003, p. 175).

Figure 4-8. The Campo facing northwest; distortion in this collage makes the paving lines look parallel. (author)

Pavement

The brick pavement of the Campo is divided into nine roughly equal wedges by grayish travertine lines, which converge at a drain (Figure 4-9). The lines taper in width from about three feet at the edges of the plaza to less than one foot where they enter the drain; they are paralleled by courses of brick, and the wedges are filled with a herringbone pattern. If the Campo floor were flat, those lines might be seen as radiating outward from a source, but the scooping floor supports the perception of convergence. The lines visually reinforce the concave slope of the floor, and connect the plaza to Siena's topography. Since the travertine lines function as drainage runnels, they are set slightly lower than the brick, which subtly drops toward each line. This scalloping effect may be the reason so many writers refer to the Campo as shell-shaped.
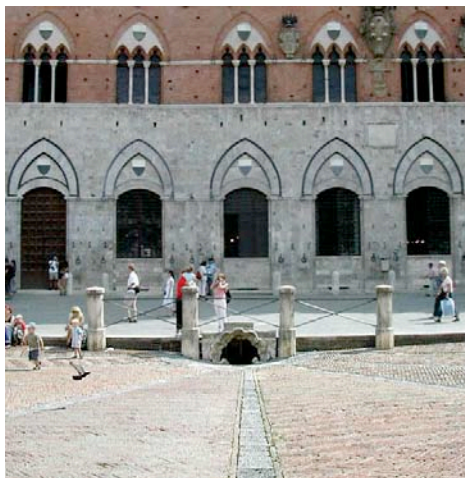
Figure 4-9. The lines of the Campo pavement leading to the drain. (author)

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There is a practical reason for using a herringbone pattern on a sloping surface. Bricks laid in this configuration have a very stable interlock that would keep the pavement from shifting downslope (Beazley, 1960). The pattern is laid parallel to the centerline of each wedge. This changing orientation of the pattern, especially as one moves across the Campo, gives it a more complicated texture than it would have otherwise, lending a distinct color to each wedge depending on the angle of viewing.

The unequal division of the pavement's nine wedges was not mentioned in any of the literature surveyed; some of the dividing lines point to plaza entrances, but they seem relatively random overall. It would appear that Medieval builders were capable of precise line-and-compass geometry, and could have made the segments equiangular. Perhaps Rowe alludes to the angular variation when he says that the division of the pavement into wedges "invokes the sociopolitical idea of a model of unity built on diversity" (Rowe, 1977, p. 32).

Figure 4-10. Left, an aerial view of the Campo (from PPS.org); right, paving transitions at a threshold. (author)

A level band of gray pavement defines the perimeter of the space and steps down to the brick from a travertine curb (Figure 4-10). These gray paving stones are probably trachyte, a common stone in Italian streets (Puppi, 2002). The stones are laid parallel to the building edge for about half the width of the gray band, which is generally occupied by shops

and cafes. The stones are laid diagonally on the inner half of the band, which is circulation

space. Transitions at entrances are nicely detailed, and the stones are textured for slip

resistance on ramps and steps.

Many writers described City Hall's tower as casting a shadow like the gnomon of a

huge sundial, the hours of which are marked by the lines in the pavement. This would be

possible if the pavement's convergence point was aligned with the tower, but they are

separated by at least 60 feet. Although it is not as accurate as a sundial, the tower's shadow

as it sweeps across the lines of the pavement is a powerful reminder of the passage of time.

The literature contains two frequent interpretations of the relationship between the

Campo's form and its pavement. "The form of the plaza may have been an allusion to the

robe of the Virgin, to which the city had dedicated itself in 1260" (Webb, 1990, p. 34). The

radiating or converging lines of pavement in this case would represent the folds of the

Virgin's protective cloak over the Sienese. A more common reading of the pattern of nine

wedges is as a simple reference to the "benevolent rule of the Council of Nine" (Webb, 1990,

p. 34). These two versions of the symbolism are not mutually exclusive, however; "the dual

nature of the space and the town hall behind it, sacred and secular sometimes simultaneously,

is replayed again and again in architecture and symbols" (Mayernik, 2003, p. 177).

Summary

The practical functions of the Piazza del Campo, as a collector of people, sun, and

rainwater, are manifested in patterns and themes found at various scales throughout the

space. Its paving pattern is an effective expression of the "civic realism" of this piazza, as

noted by Rowe (1997). "The wide-open and abstract pavement continues this theme by

allowing many events to take place without functional constraints, yet requiring each of them

to adhere to a certain decorum" (Rowe, 1997, p. 37). Its design reflects patterns of movement through the space, and emphasizes the volume contained by its floor, walls, and perceived roof.

The social ideals that founded Siena are also evident in many aspects of the Campo's design. Recurring themes in published descriptions and interpretations of the piazza include confluence, collection, protection, community, the common good, and civic responsibility (Baker, 1989; Broadbent, 1990; Crowhurst Lennard and Lennard, 1995; Lakeman, 1994; Mayernik, 2003; Rowe, 1997; Webb, 1990). The consistent expression of those themes in elements throughout the context, plaza, architecture, and pavement of the Campo make it a vivid and memorable place with a remarkable quality of integration of the parts. It is hard to imagine a paving design that could support this perception better than a simple pattern of converging lines.

Piazza Pio II, Pienza

Around the cathedral piazza, the dignified pale stone buildings have travertine extensions around the bases. They serve as benches and over the years have been polished smooth by the bottoms that rested there while viewing the great well and the Pope's magnificent piazza. Over one is inscribed "canton de'bravi," corner of the good. Do we qualify? We're feeling dreamy after dinner, the travertine still warm from the sun. We watch a small girl in a white sailor dress chasing a kitten. The full moon is poised over Piccolomini's perfect piazza. 'Amazing what a little egomania and a lot of gold can do,' Ed says. 'Perhaps he even ordered the full moon to drift overhead every night.'

(from *Bella Tuscany* by Frances Mayes, 1999)

An impoverished Tuscan village was the unlikely locale for the first three-dimensional realization of early Renaissance theories about the ideal city. Pienza was a relatively isolated hill town of about 1,500 farmers, and the birthplace of Aeneas Silvius Piccolomini, who became Pope Pius II in 1458 (Mack, 1987). Piccolomini had the sensible idea of testing new ideas about classical architecture and urban design at a manageable scale, as opposed to more grandiose schemes of previous Popes. He was acquainted with the famous architectural theoretician Leone Battista Alberti, who loaned him a copy of Vitruvius' writings in 1458 (Smith, 1992). This may have inspired his patronage of the Pienza project. He hired Bernardo Rossellino, a student of Alberti's, as his architect in 1459. The centerpiece of their design, Piazza Pio II, was complete only three years later (Mack, 1987). By the time of Piccolomini's death in 1464, 40 buildings in Pienza had been built or refurbished (Mack, 1987). Alberti's direct involvement in Pienza's design is debated by scholars (Heydenreich and Lotz, 1974; Mack, 1987; Smith, 1992), but many believe that his influence is apparent throughout the plaza.

Context

Piccolomini and Rossellino decided to site the plaza at a bend in the main street (Figure 4-11), and the resulting angles of the flanking buildings created a trapezoidal space. It has been speculated (French, 1978; Pieper, 1986) that this shape was Michelangelo's inspiration for the Piazza del Campidoglio, to be discussed in the following case study, but the dynamics of the two plazas are quite different. Piazza Pio's trapezoidal form was exploited to set its cathedral apart; to frame it with openings that look out over a beautiful valley; and to make it appear smaller, in order to avoid overwhelming the tiny plaza. This layout also allows the Palazzo Piccolomini, the Pope's home, to take an offset position, which partially hides it from the plaza and gives it a more subordinate role (Figure 4-11).
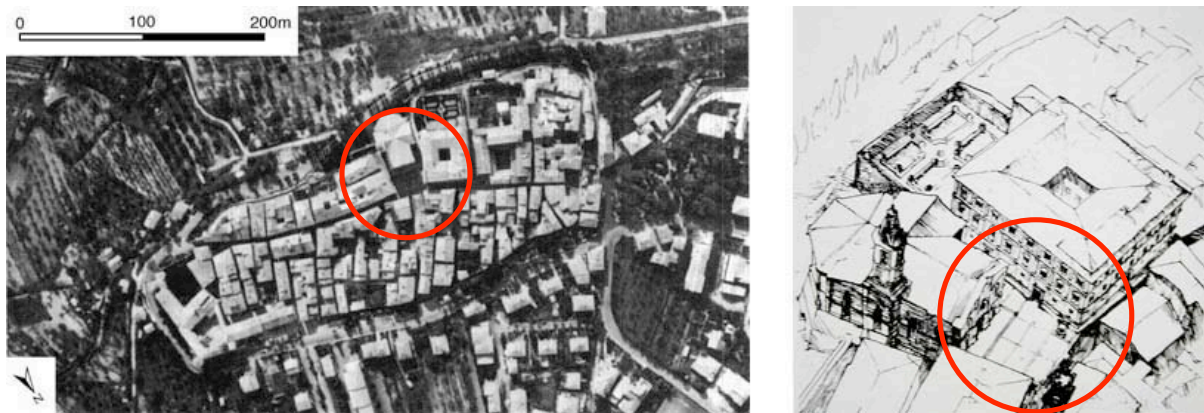
Figure 4-11 . At left, Pienza; Piazza Pio II is at top center. (from Pieper, 1986; labels added by author) At right, an aerial view of the plaza, with the cathedral at left and Palazzo Piccolomini at right. (from Pieper, 2000)

Plaza

Piazza Pio II measures roughly 75 by 85 feet, just 1/6 of an acre. It is basically a widening of Pienza's pedestrian main street, which "gives more the feeling of a pleasant recess than a plaza" (Hegemann and Peets, 1988, p. 39). The main entrances to the piazza are from the corners along the street. This oblique entry is not ideal in the Renaissance sense of framing important buildings with axial views, although there is a minor alley that is

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roughly on axis with the cathedral (Figure 4-12). Mayernik, however, believes that the plaza

is "a measured rhythmic experience, generated not by an ideal viewpoint… but the ever-

changing view of an individual's walking approach that begins at the sides of the piazza, not

on axis" (2003, p. 209). Smith (1992) agrees that movement through the space is important,

and that this is not a typical Renaissance plaza in that sense.
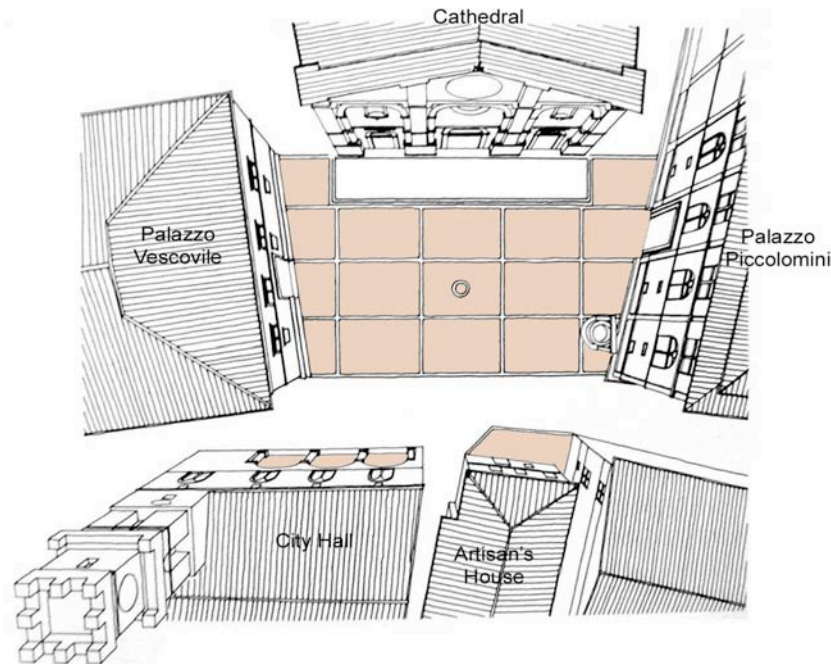
Figure 4-12. Piazza Pio II; south is at top of drawing. (from Pieper, 2000; color and labels added by author)

A public well sits at the edge of the plaza, and stone benches run along the bases of

two buildings (Figure 4-12). These "plinth facades" (Waite, 1998, p. 46) provide seating and

visually soften the transition from wall to ground. The steps of the cathedral and City Hall,

the well platform, and a café in front of the Artisan's house are also popular places to sit.

The open spaces flanking the cathedral may be the first Renaissance example of

opening up views from a city center to the countryside (Pieper, 1986). They show a distinct

departure from the enclosure of the Medieval plaza, as seen in the case study of the Campo.

Smith relates this to a changing sense of urban identity in the 15th Century, "from a

communal to a territorial concept" (1992, p. 124). Mayernik sees the views of nature as a

scenic backdrop, allowing "a softer geometry" into the plaza (2003, p. 210). Lakeman sees

the openings as permitting "shafts of light throughout the day and year" (1992, p. 86). They

also provide access from the street that follows the city wall just south of the plaza.

Architecture

The cathedral was placed on the edge of a steep bluff, requiring a foundation that continues to cause structural problems (Mack, 1987). Its façade is travertine, which glows in the shade of the piazza (Figure 4-13). Just above its center is a circular window called an *occhio* (literally, an eye). The alignment of the cathedral to the southern sun, contrary to the Church's rule of east-west orientation, was inspired by light-filled churches that Piccolomini saw in Austria (Mack, 1987). It is aligned toward the peak of Monte Amiata, a dormant volcano that dominates the landscape (Pieper, 1986). The southern windows of the cathedral frame a view of the mountain, which is not visible from the plaza. In fact, Webb (1990) points out that views from inside the cathedral give it more of a feel of being outdoors than the plaza itself, which has an interior feel.

> *Personal impressions of the site:*
>
> *Approaching Pienza, we could see the cathedral teetering on the edge of the city wall, and we knew that the piazza was behind it. Walking into town, we suddenly found ourselves standing in front of the cathedral. "Are we there?" someone asked. Our American sense of scale had led us to expect something much bigger and more important-looking. A very distinguished cathedral, and an odd assortment of buildings, surrounded a space smaller than some of our back yards. Our footsteps and voices echoed off the buildings and pavement. We began to whisper, and looked for places to sit. The stone benches along the bases of two of the buildings were surprisingly comfortable, and perfect vantage points to admire the piazza while catching a glimpse of the Orcia River valley below.*

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Figure 4-13. Piazza Pio II, facing south; the cathedral is at center, and Palazzo Piccolomini to the right. (author)

Palazzo Piccolomini takes the form of an urban palace on its north face and a rural villa on its south, with three-story loggias overlooking a hanging garden and the beautiful Orcia River valley. Although the garden is not visible from the plaza, it is worth noting because it illustrates important Renaissance ideas behind Pienza's overall design. Crandell (1992) describes parallels in early Renaissance art and garden design: "Just as deep vistas began to appear in painting, so too the medieval garden wall was punctured and opened up to an expansive and perspectival view" (p. 69). The Piccolomini gardens are credited with "a profound effect not only on the design of gardens but also on attitudes toward the very look of the landscape" (Crandell, 1992, p. 70).

Figure 4-14 shows the buildings on the north side of the plaza, just across the narrow pedestrian street. Of the five buildings that were built or renovated by Rossellino, the smallest is usually referred to as the Artisan's House; it may have been an inn, shop, or home (Mack, 1987). Several authors see the Artisan's House as representing the ordinary citizens

of the town in the social hierarchy of the plaza. Its familiar scale and vernacular style also give it the role of a baseline by which to measure the more monumental buildings (Smith, 1992). It is the only building on the plaza faced in brick, which also covers a paved inset in front of it and visually connects it to the plaza's brick pavement.

Figure 4-14. Piazza Pio II, looking north. The gray palace at left is not considered to be a part of the original plaza. The Artisan's House is left of center, City Hall to its right, and Palazzo Vescovile at far right. (author)

Pienza's City Hall is a "miniature version of other Tuscan and Umbrian town halls" (Mayernik, 2003, p. 206). It has a loggia that repeats the triple arches of the cathedral, and a clock tower that mirrors the cathedral's campanile (see Fig. 4-15). Its clock tower is not prominent from the plaza (nor visible in Fig. 4-14), since it is offset along the street. Palazzo Vescovile, the bishops' house on the east side of the plaza, is a rather plain Medieval building that appears to have been refurbished rather than built new (Mack, 1987).

The materials and surface decoration of the five buildings reveal their hierarchal status on the plaza: the travertine cathedral façade is very three-dimensional, Palazzo Piccolomini has channeled rustication in its sandstone blocks, City Hall and Palazzo

Vescovile have shallow *sgraffito* decoration in their stucco facades, and the Artisan's House

is of simple brick (Mack, 1987). Stylistically, there is more variety than commonality in the

group. "If the ideal city is the paradoxical attempt to realize a utopia, Pienza, instead,

embodies what the early Humanists felt to be the underlying principle of reality. The design

of Pienza is governed by the quality of *varietas*" (Smith, 1992, p. 99).

Even experts are divided on the subject of whether or not the architecture of Piazza

Pio II has a consistent proportional system (Hersey, 1976; Mack, 1987; Pieper, 2000). There

are, however, recurring patterns of simple shapes and proportions that are perceptible to the

average person, which visually and perceptually link the buildings to one another and to the

pavement. The most obvious pattern is a grid of rectangles, generally either square or in a

2:3 ratio. The second is a grouping of circles or semicircles. Figure 4-15 shows some of

these patterns in the City Hall and cathedral facades.
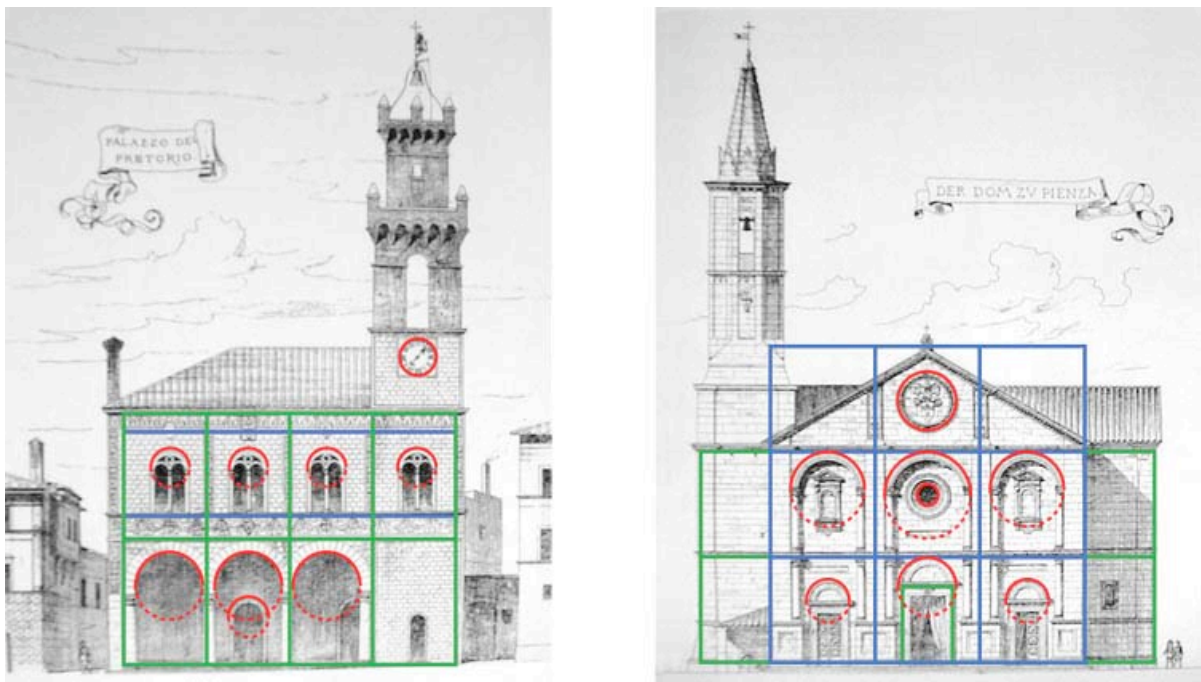
Figure 4-15. Recurring patterns in the City Hall (left) and cathedral (right). Rectangles with 2:3 proportions are
shown in green, squares in blue, and circular forms in red. (from Pieper, 2000; colored lines added by author)

A grid of rectangles in approximately a 2:3 proportion divides the City Hall into four bays, three of which form an arcaded loggia which is paved in brick like the plaza. On the second story, *sgraffito* decoration defines squares. The façade of the cathedral is divided by vertical pilasters and horizontal entablatures into a grid of squares. The three bays of its façade are logically continued in the cathedral's nave and aisles; this supports a perceptual continuation of the façade and pavement grids into the interior.

Grid patterns at various scales and proportions are also a salient feature of the Palazzo Piccolomini, which is "reminiscent of a sheet of graph paper" (Mack, 1987, p. 49). The rectangular bays of the façade are repeated proportionally in its window frames and details. The upper story windows are an invention of Rossellino's – a combination of the Roman cross and the Tuscan arched lunette (Mack, 1987). The cross repeats in the windows of Palazzo Vescovile, and the lunette is repeated in the windows of City Hall. Circular elements and arches are found in all of the buildings, often in groups of three.

Pavement

The pavement of Piazza Pio II is a grid of pale travertine lines, filled with red brick in a herringbone pattern. Webb describes the grid as "a study in linear perspective which pulls the whole composition together" (1990, p. 68). This style was not new to the Renaissance nor unique to Pienza; many Medieval plazas had been paved in the same pattern in previous centuries. The grid has historically been a symbol of man-made artifacts at all scales, including cities. In plaza settings, it also serves as a measure of scale and a perspective aid. In this case, the rectangles in the grid might be read as squares when seen from the street, which would make the plaza seem deeper than it is.
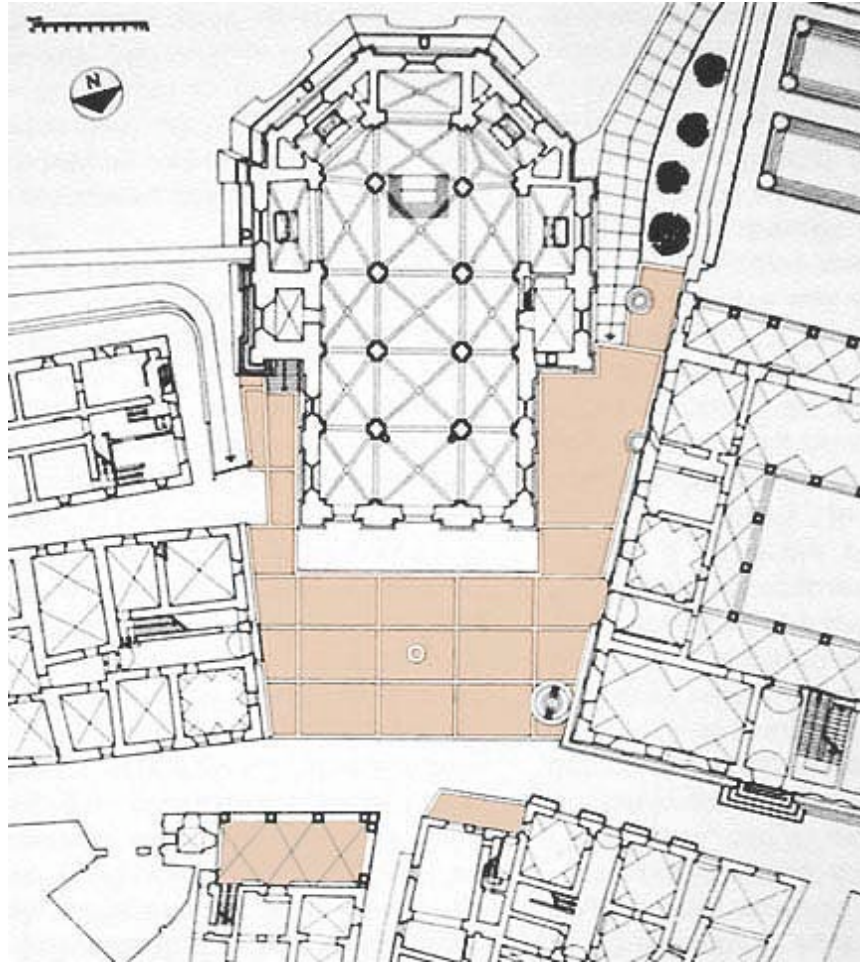
Figure 4-16. The brick and travertine pavement of Piazza Pio II. (from Pieper, 2000; color added by author)

The grid of the pavement aligns with corners, centers, pilasters, and doorframes of all of the buildings on the plaza, including those separated from the brick pavement by the street (Figure 4-16). A group of nine rectangles occupies the center of the pavement, with trapezoidal shapes continuing to the building edges. The rectangles are each roughly 2:3 in proportion, and the group of nine naturally shares the same proportion. The trapezoids are also edged in travertine where they meet the buildings (except in the Piccolomini doorway), emphasizing the shape of the piazza and the perpendicular relationship of the palace facades to the street angle. It may be our tendency to mentally simplify geometric forms that caused several writers to describe only the central group of three by three rectangles, or to dismiss

the trapezoids as if they were leftover space. On the contrary, they add a diagonal element of movement to a space that might otherwise be too perfect and static. If they were not edged in travertine, their "imperfect" shapes would be less noticeable and the piazza might be seen as a more rectangular shape.

A ring of travertine, less than five feet in diameter and made of five stones slightly wider than those defining the grid, occupies the center rectangle of the grid (Figure 4-17). The echo between the circular window of the cathedral and the ring in the pavement is reinforced by the apparent reflection of the 9-module grid from façade to pavement. The horizontal distance from the cathedral door to the pavement ring is the same as the vertical height to its *occhio*, and the circles have the same diameter (Pieper, 1986). The ring defines a center for the plaza and generates a sort of centripetal force toward it; several visitors were observed standing within the ring to view the plaza's architecture. It also reinforces the (imperfect) bilateral symmetry across the plaza's north-south axis, and implies a (non-existent) symmetry across its east-west axis. Mack (1987) refers to the travertine ring as a trace of the well's former or ideal location, but there is no evidence that the well was ever moved from the side of the plaza.
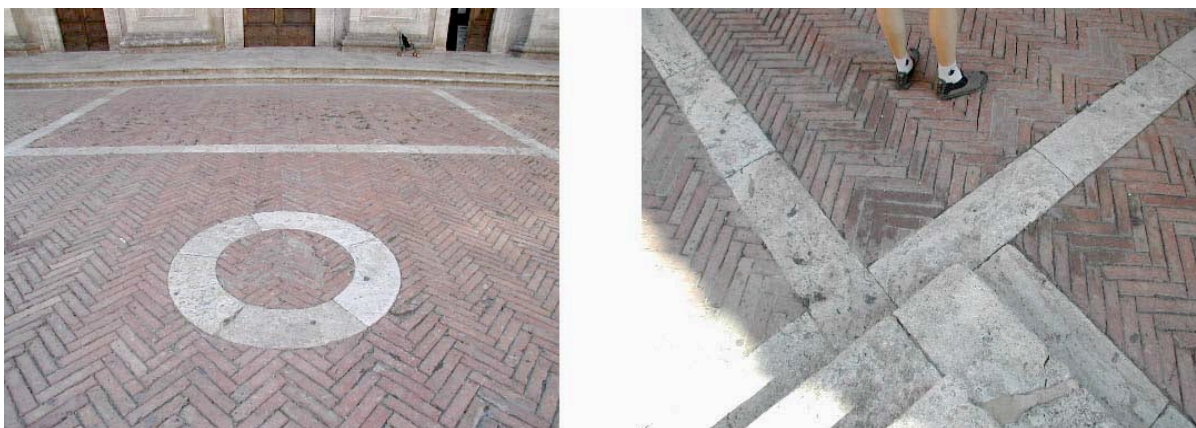
Figure 4-17. Left, the pavement's ring; right, the grid meeting the cathedral steps. (author)

The plaza was repaved in 1903, but much of the original travertine and brick was reused; Pieper (2000) believes that it was relaid precisely according to the original design, although the grade may have been changed slightly to drain water away from the cathedral. Pienza's main street was not paved at the time of the plaza's construction in 1462, and the plaza was one step higher than the street (Mack, 1987); they are at the same level now, and the street is paved in diagonally laid grey stone.

Within the travertine grid of the pavement, the brick dimensions and herringbone pattern are virtually identical to that of the Campo in the previous case study, but the effect is different. A herringbone pattern can be read as "zigzag" lines (for example, reading from side to side in the left photo of Figure 4-17) or "arrowheads" (formed by pairs of rows, perceived as an inverted V shape). In the Campo, the straight courses of bricks running parallel to the travertine reinforce the directionality of the zigzag lines, which also run more or less parallel to the travertine. In Piazza Pio II, the perpendicular axis is dominant: the arrowheads seem to point to and from the cathedral, although the directionality is still weak. Fifteen bands of double rows fill each rectangle of the pavement. Pieper (2000) notes that the numbers 3, 5, and 9 and their multiples are found throughout the plaza and its architecture. The triangular form inherent to the herringbone pattern is repeated in the cathedral's gable, the arrangement of the three door arches, and perhaps in the mental image of Monte Amiata to the south.

As mentioned previously, the pavement grid and ring seem to reflect the cathedral façade. Pieper (1986, 2000) has pursued this idea further. He seems to be the first to recognize that the shadow cast by the cathedral periodically aligns with the grid of the pavement (Figure 4-18).

Figure 4-18. The cathedral's shadow aligning with the pavement grid of Piazza Pio II.
(from the website of the City of Pienza, http://www.portalepienza.it)

This shadow alignment occurs 11 days after the solar equinox (Pieper, 1986). The
Julian calendar in effect in the 15th Century was known to be 11 days out of sync with the
solar cycle; both Rossellino and Piccolomini were likely to have been well aware of this.
The Gregorian calendar had been proposed, but the reform was controversial within the
Catholic church since the spring equinox determined the date of Easter Sunday. It was
considered heresy to tamper with the date of such an important religious holiday. Pieper
(1986) believes that the cathedral was originally designed to cast this shadow on the
scientific equinox (which would have been March 10 on the Julian calendar), and its design
was later revised so the shadow alignment would occur on the dogmatically defined March

21, perhaps due to pressure from the Church. The main buildings appear to have been well under construction at the time, and changing the grid of the pavement would have put it out of alignment with the architecture. Therefore, the only solution, according to Pieper's theory, was to add height to the cathedral. Rather than simply raising the façade and leaving the roof at its designed level, Pieper (1986) believes that the entire roof was raised approximately seven feet to give the correct height to the façade; his evidence to support this theory include the very unusual 7-foot extensions topping the pillars inside the cathedral (Figure 4-19) and the absence of an Albertian proportional system in the façade, also noted by Mack (1987).
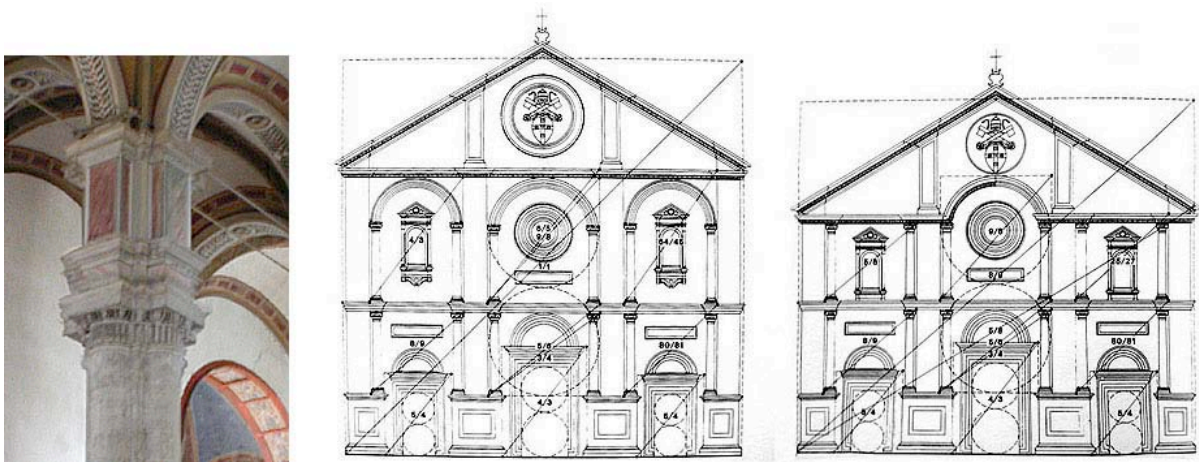
Figure 4-19. Pieper's evidence that the cathedral roof was raised after construction had begun:
at left, the extensions to the interior pillars (author); at center and right respectively, his proportional analysis of
the facade as built versus as it might have been designed. (from Pieper, 2000)

It is surprising that this aspect of the plaza's design is not documented in Piccolomini's detailed journal (he lightly dismissed the pillar extensions as owing to a mistake of Rossellino's), nor in any other professional analyses of Piazza Pio II, but Pieper's (1986) argument is convincing as to the mechanics and intention of the shadow. Gellert (2000) confirms Pieper's calculations and logic, and outlines the importance of mathematical knowledge to the fundamental concepts of humanism and their expression in architecture.

The circle's perfection and its mathematically irrational qualities made it a powerful symbol of the unknowable and the sacred to many cultures, in contrast to the quadrangle and other geometric forms with rational and measurable properties (Wittkower, 1962). Pieper interprets the circular *occhio* in the cathedral façade as the "clairvoyant eye" of God, corresponding to the pavement ring's "blind eye" of the underworld (1986, p. 103). The contrast between the light-filled volume of the cathedral and the shaded plaza pavement makes this idea credible. Both Pieper (1986) and Gellert (2000) believe the grid of nine rectangles in the pavement is a reference to the nine levels of hell in Dante's *Inferno* and in Biblical passages, but this idea is not as convincing.

The circle has also been a symbol of nature, and natural cycles, to many cultures. During the Renaissance, views of the natural world and man's relationship to it were radically changing. A secular interpretation of this pavement design might be that the ring represents natural phenomena, which are beginning to be contained and understood by rational processes (represented by the grid), and even predicted or controlled by application of the scientific method (represented by the shadow alignment).

Summary

Piazza Pio II is widely recognized as a statement of humanist ideas shared by Piccolomini, Alberti, and Rossellino. It is possible that "patron, adviser, and architect shared equally in the enterprise" (Heydenreich and Lotz, 1974, p. 45). Even though the message is weakened by an apparent concession to religious dogma, the shadow alignment on the pavement reinforces the overall theme of Pienza as the creation of men who believed in rationality and self-determination, in contrast to their Medieval ancestors' defense against, or surrender to, natural and supernatural forces.

March (1998) presents two important keys to understanding the designs of humanists: 1) each design is a microcosm of the universe, and based on natural laws; 2) each design resolves opposites, and creates new contrasts and oppositions. Unlike some utopian visions of perfection, "the humanist definition of harmony allowed for dialogue, counterpoint and dissonance" (Mayernik, 2003, p. 216). The patterns and metaphors found at various scales in Piazza Pio II appear to express the balance between pairs of universal ideas which have opposing or reciprocal relationships. For instance, the contextual setting could be read as civilization in the midst of nature; the plaza, as equality balancing hierarchy; the architecture, as unity with diversity, and the pavement as spirituality versus rationality.

Obviously, every person visiting the plaza might see different sets of meanings that are significant to them, but the interaction between and among dualities is the essence of Piazza Pio II. Every part of the plaza is vital to the visual and mental image; it is impossible to separate the elements, or to quantify the contribution that each makes to the whole effect. The pavement of Piazza Pio II is an essential and integral part of the plaza, and the perfect solution to a subtle and complex design program. The simplicity of this pavement is a fine demonstration of the principle of making every line of a design significant.

Piazza del Campidoglio, Rome

What an excitement has now infected those quiet stripes of marble which in the quattrocento *used to cover the surfaces of the most distinguished squares, such as the rounded piazza at Siena! Now the stripes radiate out in fingerlike beams from Marcus Aurelius on his pedestal to form a twelve-pointed star of flattened intersecting curves. Their fantastic pattern enflames the whole frenzied interplay of contrasts: oval, trapezoid, the background of Roman and medieval tradition, the subtly shifting interplay of Baroque light and shadow that models the walls, the grandiose gesture of the great stairway – all combine to form a single all-embracing harmony, for the relation of each to each and of the whole to its parts has been consummately affined.*
(from Giedion, 1967)

The Piazza del Campidoglio was designed by Michelangelo Buonarotti after Pope Paul III ordered him to create not only "the heart of Rome" (Bacon, 1967, p. 115), but also an expression of Rome as the "*caput mundi*" or capital of the world (Norberg Schulz, 1980, p. 151). The site, although historically significant, was "a muddy hill" with "crumbling medieval buildings" (Webb, 1990, p. 131). Given the difficulties of the assignment and the site, Michelangelo's achievement was doubly impressive. "Since Rome was the center of the earth to Renaissance humanists and the Capitoline hill was the center of Rome, the Campidoglio piazza was thus the center of the universe" (Mayernik, 2003, p. 55).

Context

Figure 4-20 shows the location of the Piazza del Campidoglio in the context of Rome. It sits on the Capitoline Hill, one of Rome's seven hills and perhaps its most important. Since ancient times, this hill had been the site of ceremonies, rituals, and triumphal returns, and the symbolic center of the Roman empire (Cooper, 2002). Just southeast of the Campidoglio lies the ancient Roman Forum, leading to the Colosseum. To the northwest, across the Tiber River, is St. Peter's cathedral and the Vatican. Although the Campidoglio was ostensibly designed as a secular site to dignify the municipal government, Cooper points

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out that it was a "stage set" in more than one sense: besides serving as a dramatic setting for civil and military ceremonies, its view of St. Peter's left "no question as to where the true authority in the city lies" (2002, p. 199). Several writers seemed to remind themselves of this plaza's secular purpose, as if they received mixed messages from the site. "The Campidoglio represents a *civic* institution… not at all a 'sacred area' and has no religious connotations whatsoever" (Zucker, 1970).
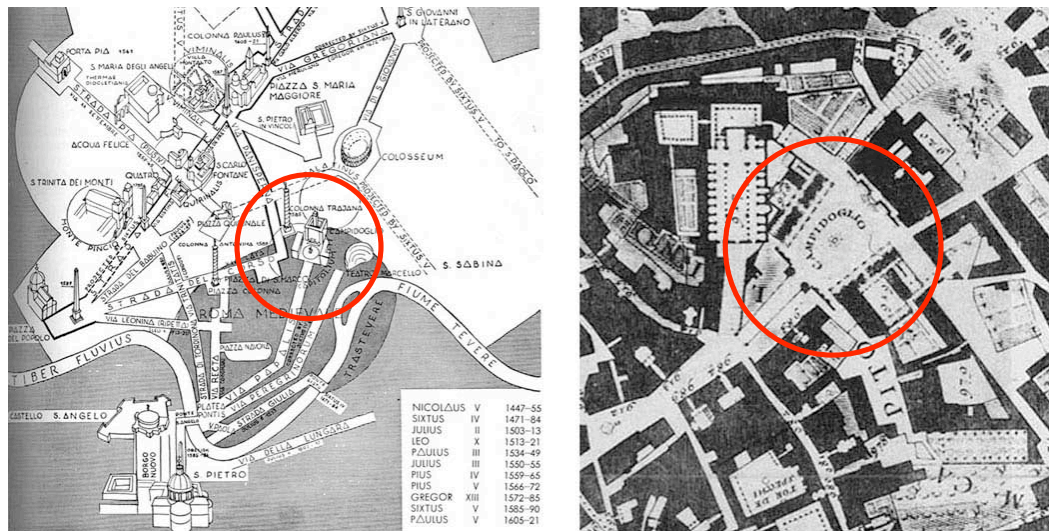
Figure 4-20. At left, a map of Rome showing the diagonal street network. (from Giedion, 1967)

At right, the area of the Campidoglio. (from http://www.lib.berkeley.edu/EART/maps/nolli.html)

At the time of the Campidoglio's design around 1540, Rome was a tangled network of streets, and various Popes devised schemes to clarify its layout (Broadbent, 1990; Norberg Schulz, 1980). Later in that century, Pope Sixtus V finally realized a plan to link the major landmarks of the city by means of "lines of force which defined the tension" between those landmarks, in the form of connecting diagonal streets (Bacon, 1967, p. 82).

Plaza

The Campidoglio is variously classified as a Renaissance, Mannerist, and Baroque plaza, and it has elements of all of those styles. Although most architectural history timelines

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would place it in the High Renaissance, Bacon (1974) declares that "in the richness of its forms, the Campidoglio heralded the arrival of the Baroque" (p. 118). Zucker (1970) believes that the Campidoglio represents "the exact transition" from the Renaissance concept of "static balance" to the Baroque idea of "dynamic motion in space" (p. 148). Michelangelo himself is hard to classify, but he is recognized as "one of the inventors, and certainly the greatest exponent, of Mannerism" (Murray, 1986, p.170).

The site for the plaza was a roughly triangular space with three buildings (Figure 4-21). By adding a fourth building, to symmetrically reflect one of the existing buildings and to block another from view, Michelangelo created an axis through the space, which Bacon describes as a "line of force" comparable to those that organized the city later in the century (1967, p. 115). He also defined a trapezoidal space that broadened toward the principal building, like Piazza Pio II in the previous case study. In both cases, the perspective effects appear to have resulted from existing site conditions as much as from conscious design.
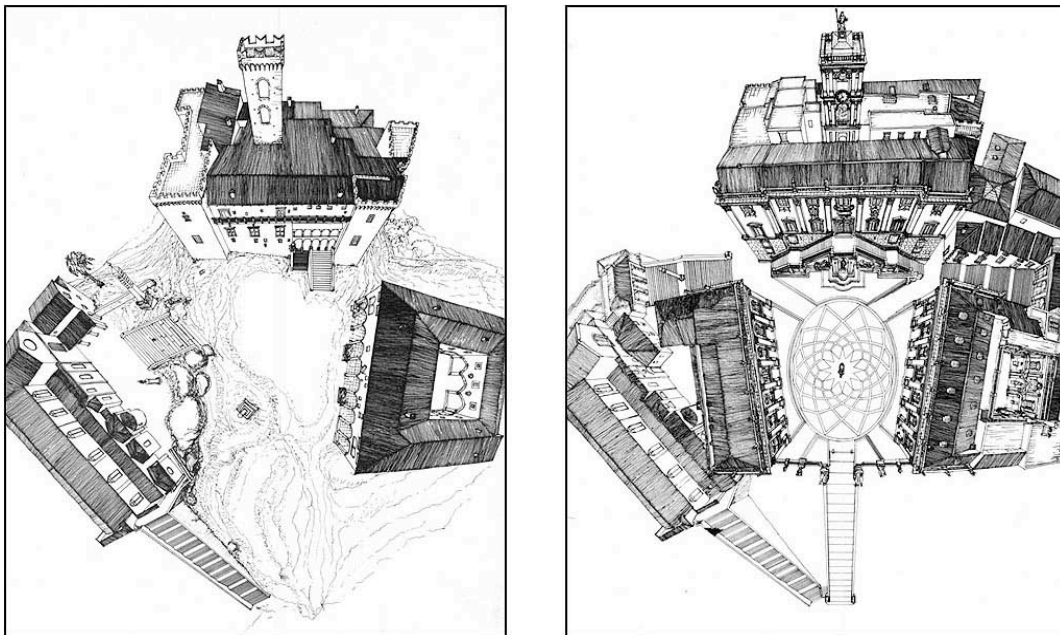
Figure 4-21. The left-hand drawing shows the Campidoglio as it was when Michelangelo started work on it. The right-hand drawing shows it as it is today, with an additional building on the left. (from Bacon, 1974)

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Michelangelo then connected the Campidoglio to the city below with a dramatic ramped staircase called the Cordonata (Figure 4-22), which was designed to dignify "a ceremonial ascent for a mounted Emperor" (Webb, 1990, p. 131). Even modern tourists are "constrained to a slow and measured ascent" appropriate to the site (Giedion, 1967, p. 65).
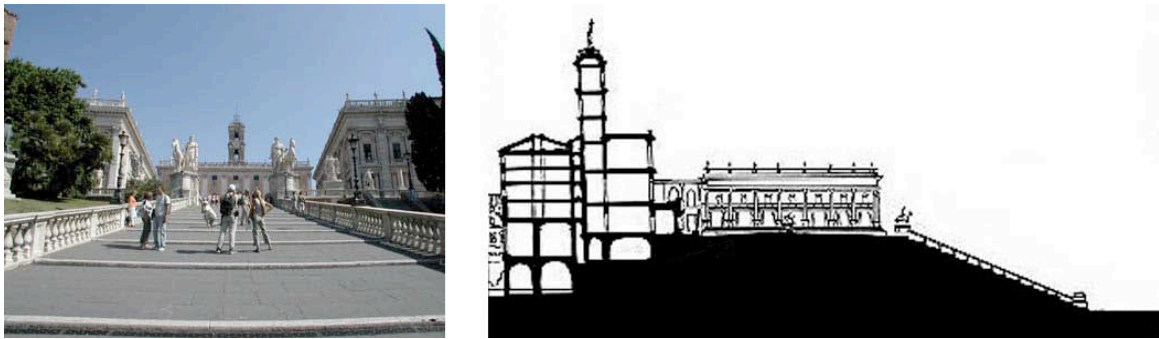
Figure 4-22. At left, the Cordonata (author); at right, a profile of the Capitoline Hill. (from CLRnet, n.d.)

At the top of the Cordonata, a balustrade topped with statues forms "an imaginary fourth wall" and a threshold to the plaza (Zucker, 1970, p. 147). In spite of its relatively modest size, averaging roughly 150 by 230 feet, the plaza (Figure 4-23) has a "feeling of triumphant architectural strength" (Hegemann and Peets, 1998, p. 48).

An elliptical inset in the pavement is set two steps lower than the building plane; it then domes subtly toward its center. An important 2nd Century equestrian statue of the emperor Marcus Aurelius (recently replaced by a copy) sits at the center of the elliptical dome, which "makes the statue look far bigger than it is" (Heydenreich and Lotz, 1974, p. 252). The elliptical center of the plaza "combined in one form the principles of centrality and axiality," regularizing the trapezoid formed by the buildings, but also propelling movement forward toward the Palazzo del Senatore at its end (Ackerman, 1961, p. 153). The trapezoidal shape of the plaza also "suggests a movement toward the background, a typically baroque trait" (Zucker, 1970, p. 146).

Figure 4-23. The Campidoglio, facing southeast toward the Palazzo del Senatore. (author)

Circulation through the plaza is influenced by the elliptical outline, the rising dome of the floor, the central position of the statue, and perhaps by the pavement pattern. Cooper (2002) mapped the movement of people through the Campidoglio one afternoon, and found that people tended to pause at the top of the Cordonata, arc to the right, and then either sit on the steps in the shade, or climb the split staircase of the Palazzo del Senatore. The author noted similar behavior, especially in the tendency to cross the plaza in an arc. Figure 4-24 reveals another tendency: to follow the white lines of the pavement.

Figure 4-24. The Campidoglio, looking northwest over the city. (author)

Views out of the plaza reveal the layers of Rome's history: the ancient Roman Forum is visible from around the sides of the Palazzo Senatore; Medieval, Renaissance, and Baroque architecture can be seen in every direction; the Vatican is barely visible to the northwest; and the modern city surrounds the site. Several writers mentioned a sense of the continuity of time, and a realization that this site "has been the nucleus of the city for two and a half millennia" (Cooper, 2002, p. 43).

Architecture

Many architectural scholars seem to agree on the integrated nature of this plaza. "The principle represented in Michelangelo's Campidoglio and inherent in Renaissance architectural thought is that the design of buildings and exterior spaces should be physically integrated" (Trancik, 1986, p. 82). This plaza is unusual in that one person designed the building façades, the ground plane's form and covering, and even the stairs approaching the plaza from the city below. There is no doubt that this is an important factor in the harmony of the parts and the wholeness of the place. The same might be said of Pienza's design by Piccolomini and Rossellino, or of the Campo's regulation by the Nine.

> *Personal impressions of the site:*
>
> *Everyone seemed to be walking very slowly in the heat and humidity of Rome, especially climbing the Cordonata. Almost every person stopped at the top of the climb to take a photograph of the piazza, and then most of them headed for the shade. Some of us walked in aimless arcs around the center of the space, gawking up at the serene statue of Marcus Aurelius and then down at the restless paving pattern. Seen up close, the pavement looked too new to fit the space very well – there were almost no visible repairs or signs of wear. The swirling effect of the pattern, combined with the domed ground plane, made me feel dizzy and unbalanced. I climbed to the top of the Palazzo Senatore's stairs, where public speeches were traditionally given. The view, and the breeze, were much better from up there.*

Construction of Michelangelo's design for the Campidoglio was begun by 1546, but very little work was completed on it until long after his death. Murray (1986) and Cooper (2002) believe that the modifications of subsequent architects lessened the impact of the whole. Nevertheless, the architecture of the Campidoglio is historically and experientially fascinating. The sense of horizontal movement along the plaza's axis is checked by strong vertical and diagonal elements. The Palazzo Senatore's split staircase gives "the impression of an element 'pressed' against the wall by the expanding, rising oval in the floor of the square" (Thiis-Evensen, 1989, p. 107).

The giant order of pilasters that Michelangelo introduced here, tying two stories together with one unbroken vertical element, was a revolutionary solution to the problems of arresting the long axis of movement through the plaza, unifying the architecture, and adding a vertical dimension to relatively low buildings (Cooper, 2002). The statues topping the rooflines, most of which are ancient Roman, "lift the eye upward and punctuate the sky, extending the vertical line of the giant order" (Cooper, 2002, p. 188). Norberg-Schulz finds in Michelangelo's architecture "three zones in vertical succession [which] symbolize respectively the inharmonious earthly existence of man, the cool peace of the intellect, and the heavenly perfection of the soul" (1965, p. 124). Those zones could be seen as corresponding to the pavement, facades, and rooflines, respectively.

Pavement

The domed ground plane of the Campidoglio is "a dramatic example of… the rising floor" archetype (Thiis-Evensen, 1989, p. 85). A conflict between the bedrock of the hilltop site and the flat surface of the building plane is expressed in the way "the rock appears to have broken through the surface" in the convex ellipse (Thiis-Evensen, 1989, p. 85). The

two steps descending into the ellipse symbolically "reveal the thickness of the piazza floor and thereby the force needed to break the surface" (Thiis-Evensen, 1989, p. 85). Michelangelo did not leave drawings for any of his designs. Duperac's engravings of the Campidoglio (Figure 4-25) are believed to be the best representation of his intentions (Cooper, 2002; Heydenreich and Lotz, 1974). According to those engravings, Michelangelo's plan did not include the five entrance ramps to the ellipse, which Thiis-Evensen (1989) believes weaken the conflict, allowing the rock to "win" by breaking up the surface into smaller pieces (compare Figure 4-25 to Figure 4-21). Norberg-Schulz sees the convex ground plane as "the *caput mundi* [capital of the world] idea united with the knowledge that the earth is a sphere" (1965, p. 172). The doming effect adds an unusual dimensionality and power to this pavement, which would be impressive even on a flat plane.
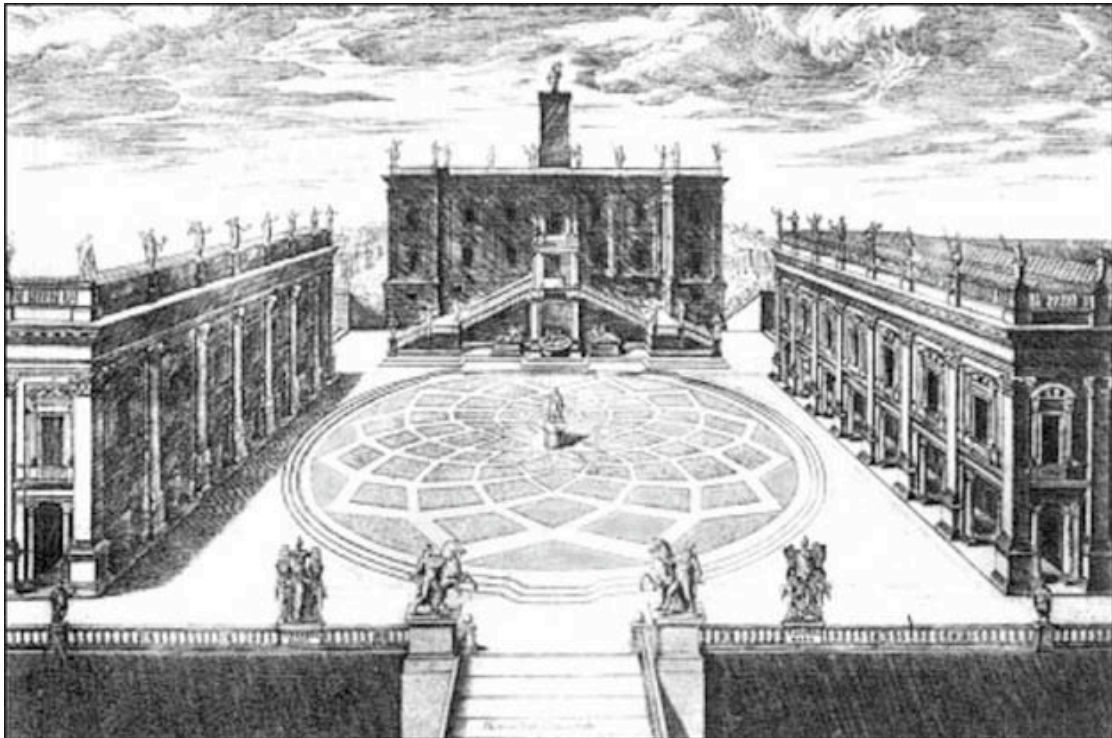
Figure 4-25. Michelangelo's intended design for the Campidoglio, engraved by Duperac in 1569, shows lighter paving on a flat, unbroken building plane contrasting with the darker ellipse, which is three steps lower along its perimeter. (Courtesy of M.X. Benedict, from www-personal.umich.edu/~mxb)

This paving design's important role in the visual and emotional impact of the Campidoglio is frequently mentioned in the literature. "Without the shape of the oval, and its two-dimensional star-shaped paving pattern, as well as its three-dimensional projection in the subtly designed steps that surround it, the unity and coherence of the design would not have been achieved. The paved area stands as an element in its own right, in effect creating a vertical oval shaft of space which greatly reinforces the value of the larger space" (Bacon, 1974, p. 118). Trancik agrees: "the three-sided, subtly triangular layout of the buildings is unified by an elaborate, elliptical paving pattern. This paving pattern, a primary element in the plan, sets off the statue of Marcus Aurelius in its center and links the surrounding façades and stairs" (1986, p. 82). The apparent arcs in the pattern (actually made up of straight segments) add another diagonal element to echo the Cordonata's slope and the prominent split staircase of Palazzo Senatore. The broad white travertine lines visually reiterate the vertical white pilasters of the buildings and connect them to the center of the ellipse.

Although the convex form of the ellipse was in place shortly after Michelangelo's death, the pattern of intersecting arcs was not laid according to his plan until 1940. A simple radial design was in place until that time (Ackerman, 1961). Williams (1997) has analyzed the geometry of the Campidoglio's paving (Figure 4-26). Pompeiian mosaic pavements from the 1st Century BC contain similar rosette patterns, composed of overlapping circles or spirals (Williams, 1997). The Campidoglio's rosette, however, is distorted to fit its elliptical frame. "The use of the ellipse as the container for the rosette, a pattern usually inscribed in a circle, results in a compression of the familiar motive… it becomes an ellipse as the pattern grows away from the center" (Williams, 1997, p. 149).
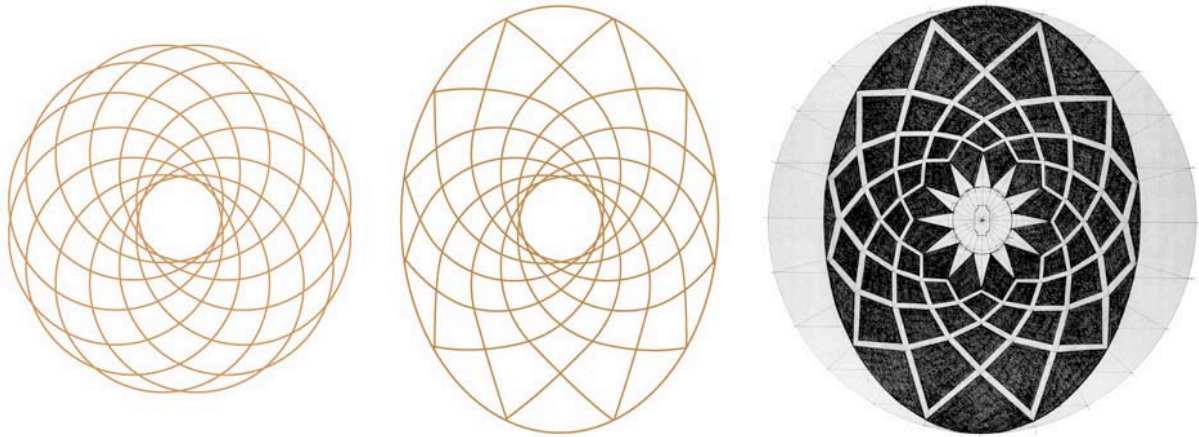
Figure 4-26. The rosette pattern of the pavement; at left, a standard configuration for a 12-cycle rosette (author); center, the same design distorted and cropped to an ellipse (author); right, the existing design of the Campidoglio pavement, with a gray circle inscribed for a mathematical analysis (from Williams, 1997).

The base of the statue sits on an oval; at the tips of the star, and in the first ring of modules forming the rosette, the form is almost perfectly circular; subsequent rings of modules are increasingly distorted as they approach the edges of the containing ellipse, adding to its dynamic quality (Williams, 1997). Cooper (2002) believes that Duperac's engraving (Figure 4-25) indicates that the star should have been elliptical as well. Its twelve points may be a reference to the zodiac, with the domed ellipse symbolizing Achilles' shield (Ackerman, 1961). A close examination of another engraving by Duperac shows a subtle pattern in the dark spaces of the rosette that is not present in the current pavement.

The pattern of the paving can be seen as simultaneously having dynamic and centering qualities, both expanding and contracting. For example, Trancik (1986) writes, "the oval paving pattern brings the piazza to rest, counteracting the directional pull established by the angles of the buildings" (p. 66). Norberg-Schulz describes the ellipse as "the synthesis of enclosure and directed movement," and the pattern as creating "a strong centrifugal movement which contrasts with the converging façades" (1980, p. 152). "The expanding ripples of the central pattern emphasize movement to the edge… the pattern

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constantly and repeatedly links the centre and the edge, it unifies the space and its enclosing elements" (Carmona et al., 2003, p. 161). Webb (1990) sees "a kaleidoscopic image that fragments and reunites the separate elements" (p. 133).

These apparently contradictory qualities lend themselves to different interpretations of meaning, many of which have connotations of energy and struggle. Thiis-Evensen (1989) writes that "the star pattern with the emperor's statue at its centre has often been interpreted as a description of the curvature's outward expansion. But, the pattern may also be seen as a net concretely 'restraining' any expansion from beneath. This is held together by the emperor himself, which adds to the motif's ideology in that the emperor is sublimated as the master of nature – man bringing nature under control" (p. 85). This idea of a power struggle between man and nature is reinforced by Thiis-Evensen's description of the rising floor archetype as "the flexed muscle of the earth" (1989, p. 83). The ongoing struggle between Church and state is another interpretation. Notions of the whole design as pulling "chaos into order" (Bacon, 1974) could be read into the large, smooth-sided white travertine stones set in a matrix of small dark granite cubes.

Several authors compared the rosette pattern of this pavement to the opposing spirals carved in the domed *omphalos* stone at Delphi, which Ancient Greeks believed to represent the navel or birthplace of the world, and the center of its energy. Ackerman (1961) believes that "the ancient Romans moved the *umbilicus mundi* [navel of the world] figuratively from Delphi to the Forum, where it remained until medieval legend shifted it once more to the Campidoglio" (p. 169).

Summary

"The piazza is a battleground of contesting forces" (Webb, 1990, p. 133). Conflict

and ambiguity are signatures of Michelangelo's work, and the source of its emotional power

(Ackerman, 1961). Every theme is intensified by the presence of its opposite. Norberg-

Schulz (1965) points out that any place has meaning not only as a destination, but also as a

"point of departure. The tension between centripetal and centrifugal forces, therefore,

constitutes the essence of any place" (p. 46). "Michelangelo here [in the Campidoglio]

succeeded in symbolizing the essence of place, as perhaps nobody else in the history of

architecture" (Norberg-Schulz, 1965, p. 48).

The pavement of the Campidoglio is a vital part of the place as a whole. It relates to

the plaza's physical setting, history, geometry, axes, and architectural facades, and honors the

statue at its center, while lending itself to multiple interpretations of meaning. In another

setting, this design might be overwhelming. In fact, French (1978) states that "the three

flanking structures play a subordinate but wholly supportive role" to the pavement (p. 81). In

the hands of a lesser designer than Michelangelo, that could be a serious mistake.

Piazza San Marco, Venice

*So much beauty is united on this unique little patch of earth, that no painter
has ever dreamt up anything surpassing it in his architectural backgrounds; in no
theatre has there ever been seen anything more sense-beguiling than was able to
arise here in reality... If we were to examine the means by which this unexcelled
grandeur was achieved they would, indeed, prove to be extraordinary: the effect of
the sea, the accumulation of superlative monumental structures, the abundance of
their sculptural decoration, the rich polychromy of S. Marco, the powerful
Campanile. However, it is the felicitous arranging of them that contributes so
decidedly to the whole effect.*

(from Sitte, 1945)

The Piazza San Marco, also known as St. Mark's, was referred to by Napoleon

Bonaparte as "the most beautiful drawing room in Europe" after he added the final building

to the plaza in the 19th Century (Broadbent, 1990, p. 49). The plaza developed over the

course of almost a thousand years; many architects were involved, each responding to the

work already in place, in perhaps 30 phases of building and rebuilding (Broadbent, 1990).

"Nevertheless, the whole forms a harmonious ensemble" (Hegemann and Peets, 1988, p. 16).

Context

Venice has been a tourist destination of sorts for at least 1000 years (Webb, 1990),

and Piazza San Marco has been "the political, religious, and social center of the city" for at

least that long (Samona, 1970, p. 209). It served as a stage for public rituals and processions,

always beginning and ending in the Piazza, which had "a drama, a sense of narrative being

played out, that was unique to this city" (Mayernik, 2003, p. 100). Everything in the Piazza

San Marco is "freighted with history or legend" (Webb, 1990, p. 75).

The city (Figure 4-27) is made up of 117 islands in a lagoon; it was originally

populated by refugees from the mainland to the north during wartime in the 5th Century

(Pregill and Volkman, 1999). "The air of unreality provided by the setting is increased by

symbolic connotations associated with islands," such as escape and refuge (Baker, 1989, p. 130). The settlers gradually reclaimed the islands by constructing canals to drain them, and supporting their buildings on deep pilings (Pregill and Volkman, 1999).

Figure 4-27. Venice: the Grand Canal is the backward "S" shape, the lagoon surrounds the city, and Piazza San Marco is circled. (from http://www.spaceimaging.com; labels added by author)

Trade with the East was the basis of Venice's wealth and a major influence on its style of architecture and urban design (Heydenreich and Lotz, 1974; Webb, 1990). The distinctive Venetian Gothic style has a "scintillating vibrating, and luminous quality" owing in part to the light reflected from the canals (Benzel, 1998, p. 93). Since Piazza San Marco sits at the traditional point of entry to the city and the Grand Canal, it served as a threshold or transition space to both. "A threshold can often provide visual and physical integration of the landscape if it possesses qualities of both the spaces it connects—the environment that is being left behind as well as the place being entered" (Dee, 2001, p. 171).

Although modern visitors are more likely to arrive by train from the mainland, San Marco is still a primary destination and orientation point for the city. Kevin Lynch used this

plaza to illustrate his concept of a node: "Highly differentiated, rich and intricate, it stands in sharp contrast to the general character of the city and to the narrow, twisting spaces of its immediate approaches. Yet it ties firmly to the major feature of the city, the Grand Canal, and has an oriented shape that clarifies the direction from which one enters" (1960, p. 78).

Plaza

Venice's network of winding streets and canals was characterized as a maze or labyrinth by several writers, which "contrasts with the order and clarity of the piazza" (Baker, 1989, p. 130). The approach to Piazza San Marco "epitomizes the 'surprise approach, explosion of space' concept used in so many of the Italian squares" (Kidder Smith, 1955, p. 50). As in Siena's Campo, entering this plaza from Venice's narrow streets dramatically contrasts the experience of compression and relative darkness to one of expansion and light. Approaching from the lagoon (at the bottom of Figure 4-28) gives a different impression, similar to entering a building from an outdoor space.
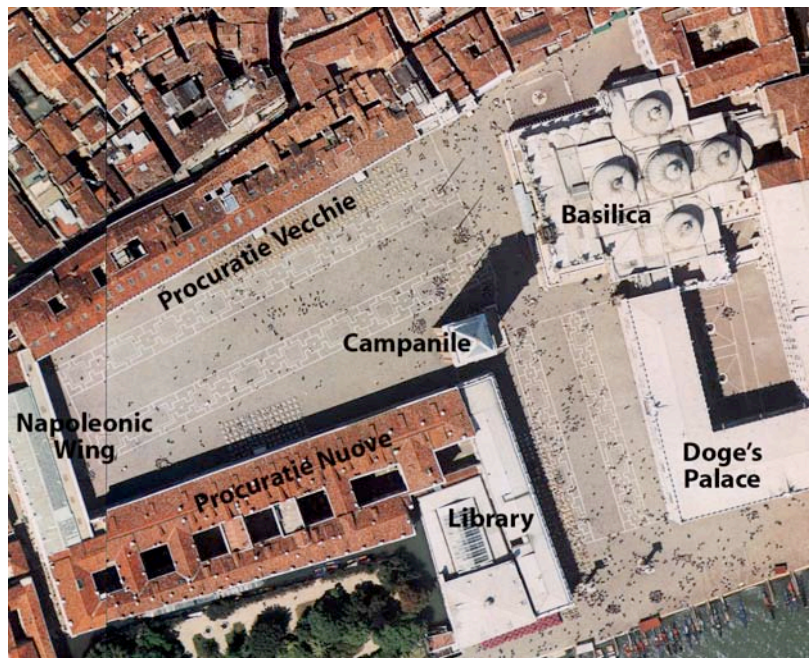
Figure 4-28. Aerial photograph of the plaza. (from http://veniceblog.typepad.com; labels added by author)

Piazza San Marco has two main parts: the Piazza itself (the larger space in Figure 4-28) and the Piazzetta, which runs roughly perpendicular to the piazza and connects it to the lagoon. The Piazza is 570 feet in length from its western end to the domed Basilica (Hedman and Jaszewski, 1984). Taken together, the Piazza and Piazzetta cover 4.41 acres, roughly five times the area of the Piazza del Campidoglio in the previous case study (Mann, 1993).

The Piazza began as a forecourt to the Basilica San Marco in the 9th Century and doubled in size around 1176, filling in a canal and taking the space formerly occupied by an orchard (Webb, 1990). The entire complex evolved in stages, especially during the 15th and 16th Centuries. As seen in the last two drawings of Figure 4-29, the north-south width of the Piazza was increased when a building was removed in the 16th Century. Its Campanile or bell tower was left in place, disengaged from all of the adjacent structures.
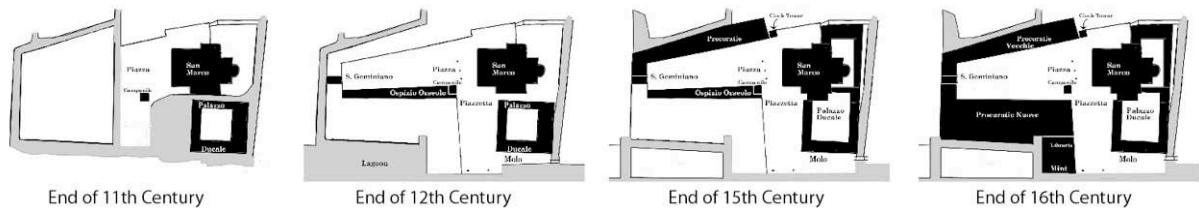
Figure 4-29. Stages in the evolution of Piazza San Marco. (from Zimmerman, 1999)

Although it is certainly not the most beautiful structure on the plaza, the Campanile (Figure 4-30) plays an important role in the overall picture. "The corner of the L-shaped square becomes a critical point of emphasis for the visual cohesion of the space" (Kostof, 1992, p. 150). The Campanile functions as a fulcrum or hinge influencing movement, "the mobile link between two immobile parts… this translates into a pause and a change either in the form of movement or in its direction" (Janson and Burklin, 2002, p. 247). The Piazza and Piazzetta might otherwise be perceived as two separate spaces. They "are not only linked by the structure of the campanile; they are also integrated via the intermediate spaces

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created by the clever positioning of the tower" (Janson and Burklin, 2002, p. 249). The Campanile, roughly the same height as the clock tower in Siena's Piazza del Campo, serves a similar purpose in this plaza: as a "tent pole" that defines the apex of a complex volume of space (Hedman and Jaszewski, 1984, p. 84). It also serves as a long-range landmark for pedestrians who might be disoriented in the streets of Venice and, of course, for watercraft approaching from the lagoon.

Figure 4-30. At left, the Piazzetta, looking toward the canal; at right, the Campanile. (author)

Huge stone columns at the southern end of the Piazzetta (Figure 4-30) "hint at a screen" which "prevents the space of the Piazzetta from leaking out completely into the canal" (Broadbent, 1990, p. 51). Statues of the patron saints of Venice top the columns, and public executions traditionally took place in the space between them (Broadbent, 1990). The plaza has also been the site of bullfights, spectacles, markets, and ritual processions of church and state. It was sometimes intentionally flooded with water for boating events in the past; natural flooding now occurs several times per year due to the gradual subsidence of Venice (Broadbent, 1990).

Figure 4-31. Cafe tables and musicians on the plaza. (author)

The Piazza is frequently described as a drawing room, ballroom, salon, or other indoor space. It has a strong interior feeling, due in part to elements like draperies on arcades (Figure 4-31), and is "enclosed to the point of being segregated from the texture and block pattern of the city" (Trancik, 1986, p. 67). Tourists often "describe St. Mark's Square as a 'courtyard'" (Zucker, 1970, p. 115). The continuity of the arcades fronting the western end of the plaza contribute to that effect. Along the edges of the Piazza, café tables and musicians invite people to sit and admire "a grandiose stage setting, dominated by the church" (Heydenreich and Lotz, 1974, p. 87). There is very little seating on the plaza other than that provided by the cafes.

Personal impressions of the site:

Piazza San Marco was filled with people, but strangely quiet like most of Venice. I was disappointed that a huge movie screen blocked the view of the piazza, and then embarrassed to find that it was for the premiere of an animated American film – it seemed so out of place. We sat at a café with a live band, and watched the sun set on the roofline ornaments of the Basilica and Doge's Palace. Clouds of pigeons moved from one spot to another as people scattered bread crumbs. The band launched into a ballad from the 1940s as an elderly couple was passing by, and they took a few rusty dance steps before resuming their stroll. When our bill came, it seemed like a bargain – about $32 for two bottles of beer plus an "entertainment" fee.

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Architecture

Venetian architects "looked to the East for inspiration, emphasizing gorgeous surfaces over perspective, and conspicuous show (often of looted treasures) over piety" (Broadbent, 1990, p. 74). The obvious star of the show on the plaza is the Basilica of San Marco and its ornate Byzantine façade (Figure 4-32). It was built in 828 as a private chapel for the Doge (ruler of the city-state of Venice) and was enlarged twice by 1063 (Broadbent, 1990). It projects out into the Piazza so it can be seen from the Piazzetta as well.

Figure 4-32. The Basilica San Marco's decoration and nested arches. (author)

"The Basilica conveys a profound sense of wonder and delight in the variety and richness of life, and sets the tone for the atmosphere in the Piazza" (Crowhurst Lennard and Lennard, 1995, p. 37). It consists of "three layers, or strata" made up of five deep and nested arches, a relatively flat plane above them, and "an orgy of pinnacles, porches, arcades, and statues" (Hildebrand, 1999, p. 108).

The buildings at the western end of the plaza act as "background" to the Basilica's "foreground" (Baker, 1989, p. 154). They were built during the Renaissance to house the

attorneys and administrators of San Marco. The Procuratie Nuove, on the south side (Figure

4-33), is roughly perpendicular to the Basilica, while the facing Procuratie Vecchie diverges

at an angle that approximately centers the Basilica at the eastern end of the Piazza. Looking

west from the Basilica, "the diminishing perspective induced by the angle of the Procuratie

Vecchie exaggerates the apparent length of the square, this being enhanced by the close

spacing of the hundred columns in the arcade" (Baker, 1989, p. 146). The regular rhythm of

the arcades at this end of the Piazza make a fitting background for religious processions,

since they "can cause the time sense to expand, so that while the kinesthetic sense is noting

rhythm and movement, the visual sense sees an unchanging scene" (Zimmerman, 1999, p.

323). The Napoleonic Wing that closes the western end of the Piazza was commissioned by

Napoleon in the 19th Century while his army occupied Venice (Samona et al., 1970).

Figure 4-33. Left, the Procuratie Nuove; right, the Procuratie Vecchie. (author)

In plaza settings, the surfaces of buildings are perceptually more significant than

masses or perspective effects (Webb, 1990). "The closer the wall of the square or plaza

resembles the two-dimensional quality of the internal room, the greater will be the feeling of

enclosure" (Moughtin, 2003, p. 101). The Venetian Gothic style lends itself to this setting because it emphasizes surfaces and lightness over mass (Rasmussen, 1959). "What Venice shares with the East is the delight in lavish surface decoration, especially in polychrome ornament" (Heydenreich and Lotz, 1974). The Doge's Palace, which was the first building on the plaza, illustrates this style of ornament and its visual effect (Figure 4-34). "Contrary to all architectural rules its walls are massive above and completely pierced below. But this is not at all disturbing; there is no feeling of top-heaviness" (Rasmussen, 1959, p. 85).
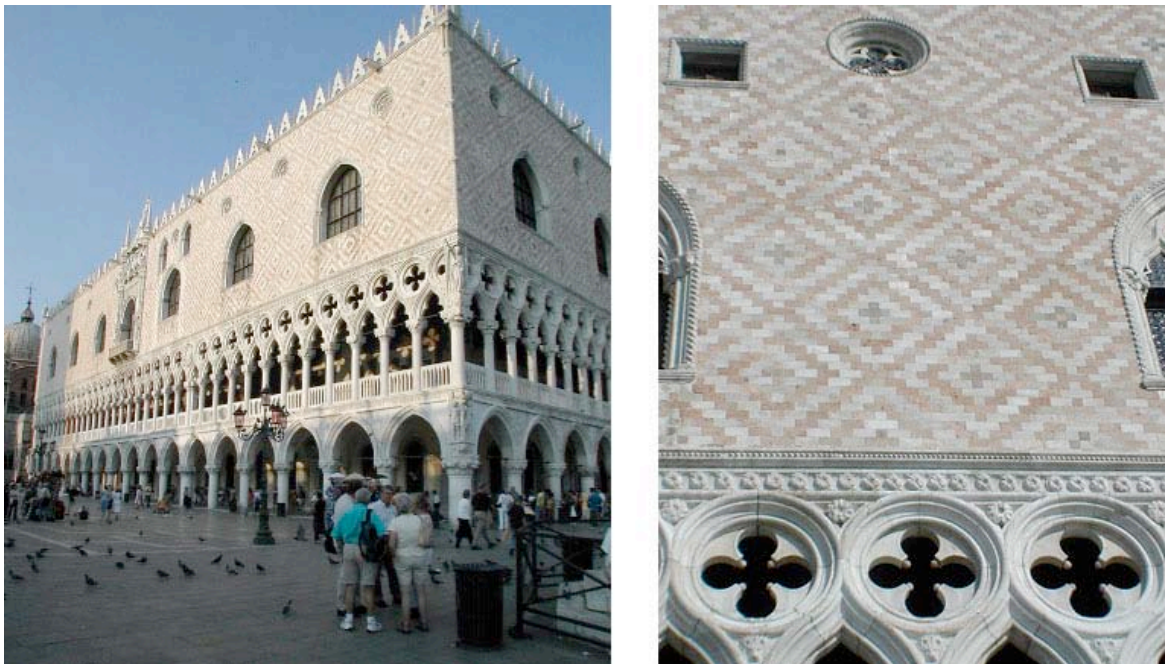
Figure 4-34. The Doge's Palace, or Palazzo Ducale; at right, a detail of the diaper pattern in its facade. (author)

The Doge's Palace was burned and rebuilt twice, and its interior and courtyard have a different flavor from its Venetian Gothic façade (Broadbent, 1990). "The [Doge's] Palace has its Gothic vigor spiced with an Eastern ebullience which reflects and is reflected into the sparkling blue waters which it faces" (Baker, 1989, p. 153). Its diaper pattern of nested diagonal squares "evokes major monuments along the Asian silk roads," which carry similar patterns in textured brickwork (Mack, 2002, p. 11). Other features appear to have been

inspired by Islamic architecture in Egypt and Syria (Mack, 2002). Unlike the arches of the Basilica, those of the Doge's Palace are "in two stories, stacked not nested, in a precise width relationship of 1:2" (Hildebrand, 1999, p. 108). Sansovino's Library across the Piazzetta is elegant, understated, and "the perfect foil" to the Doge's Palace (Baker, 1989, p. 153). "The delicate Gothic tracery of the Doges' Palace faces the ponderous articulation of the library," but "the two facades look equally weighty" (Heydenreich and Lotz, 1974, p. 236).

Some of the features common to these buildings are shadowed arcades, simplified planar surfaces above them, and elaborate skylines (Hildebrand, 1999). Many of them share 1:2 relationships: for example, arches dividing in two, or double square proportions. Salingaros (2000) notes 1:3 relationships and a hierarchal structure in the proportions of the buildings and the space itself. "Each surrounding building has subdivisions at roughly 1/3 its overall size, and further subdivisions at roughly 1/7, 1/20, etc… It is the subdivisions, or architectural scales, of the disparate and visually dissimilar buildings around the plaza, that cooperate with each other and with the pavement to make us experience this space as a magnificent ensemble" (Salingaros, 2000, p. 227).
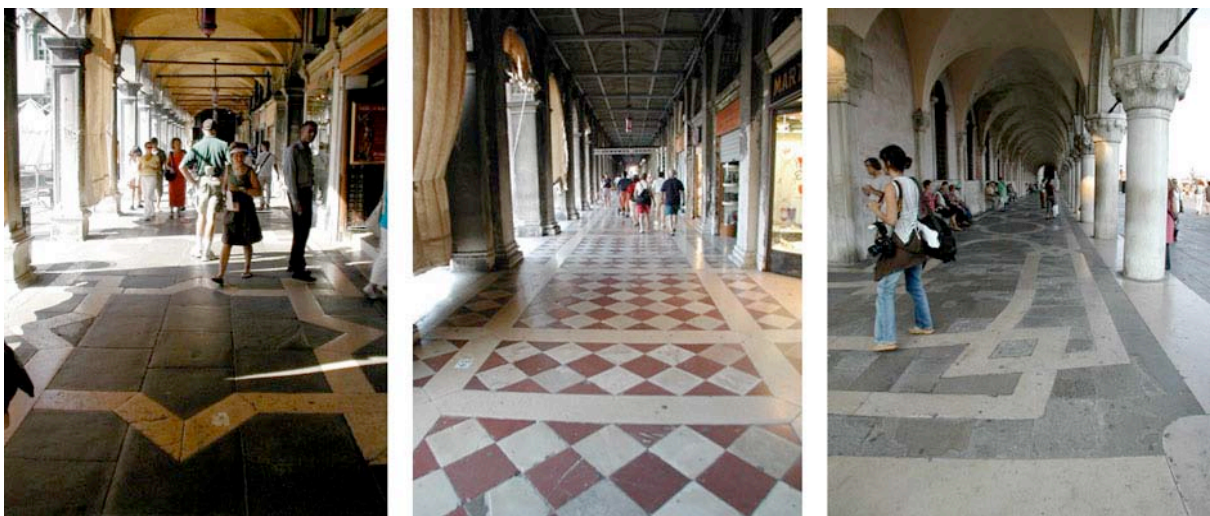
Figure 4-35. Arcades of the Procuratie Vecchie, Procuratie Nuove, and Doge's Palace. (author)

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Piazza San Marco encourages pattern-seeking games, "each new image presenting novel elements and relationships that also develop from and relate to what we have already seen" (Hildebrand, 1999, p. 112). Strolling the plaza, "we engage ourselves in 'collecting' buildings with deeply shadowed arcades, wide and shallow arches, heavy superstructure, and elaborate skyline. And as we add to our collection different examples of the 'thing,' each a little different from the last, we experience pleasure" (Hildebrand, 1999, p. 136).

Pavement

The city of Venice has a rich variety of pavements. Sammartini (1999) speculates that "in a city built on water, the endless shimmering reflections of their churches and palaces constantly attracted their gaze downward" (p. 9). Brick was the traditional Venetian paving material for many centuries, and the Piazza San Marco was first paved with brick in the 13th Century (Puppi, 2002). It was laid in a herringbone pattern, with lines of light stone running parallel to the long axis of the plaza and crossing it at least once (Figure 4-36).

Figure 4-36. Detail from Gentile Bellini's 1496 *Procession in Piazza S. Marco*, showing the original pavement. (from http://gallery.euroweb.hu)

The brick pavement was replaced in 1723 with a harder-wearing combination of trachyte (a dark igneous rock) and white Istrian stone, which is similar to travertine (Puppi, 2002). The design consisted of squares, rectangles, and ovals in a pattern very similar to the present pavement (Figure 4-37). It was designed by a Venetian architect named Andrea Tirali, and when it was laid the floor of the entire plaza was raised by a meter to mitigate the effects of frequent flooding (Sammartini, 1999).
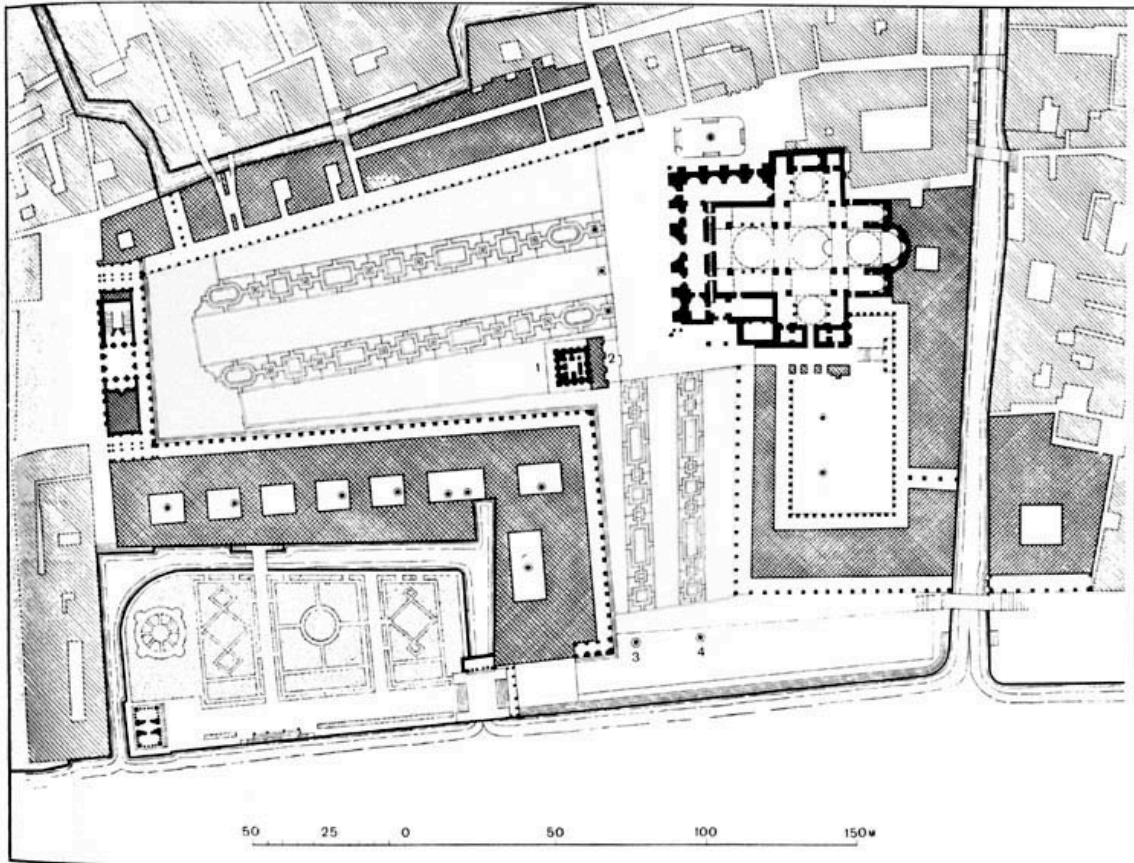
Figure 4-37. The 1723 paving design by Tirali. (from Trancik, 1986)

That pavement was replaced again with "an identical pattern" in 1890 "due to wear and tear" (Puppi, 2002, p. 33). As this is relatively hard stone, that gives some indication of the heavy use this plaza received. However, it was apparently not identical, as can be seen by a comparison of Figures 4-37 and 4-38. The Napoleonic wing that currently closes the

western end of the plaza wasn't in place when it was paved in 1723, and a small church and

the extending wings of the Procuratie buildings formed a more broken façade (Broadbent,

1990). The Baroque arc at the west end of the paving pattern in Figure 4-37 may have been

intended to define an edge to the plaza that the Napoleonic Wing achieves now. That arc, as

well as the oval shapes within the bands of the 1723 pattern, may have related the pavement

to the architecture (which is dominated by rounded arches) more effectively than the present

squares and rectangles do.
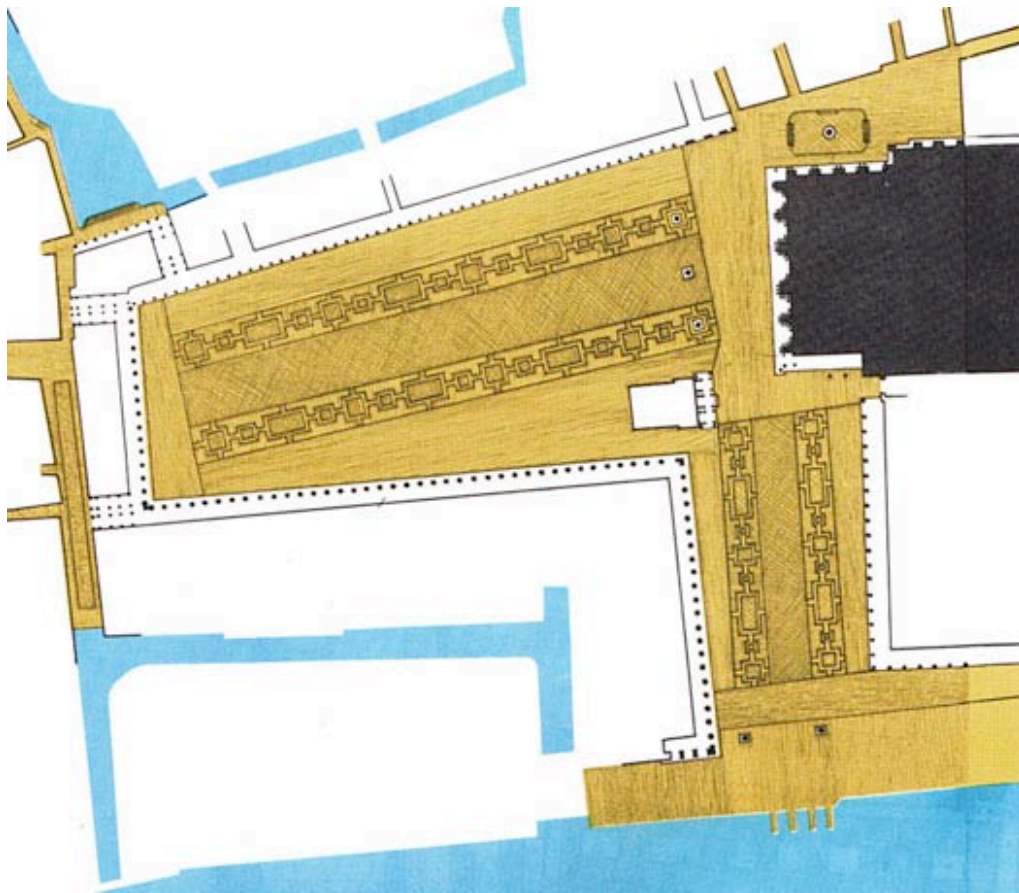
Figure 4-38. The current paving pattern of Piazza San Marco. (from Bacon, 1967)

The alignment of the southern band of pattern in the Piazza parallels the northern

band, but it also indicates a trace of the building that was formerly attached to the Campanile.

As mentioned previously, the Basilica addresses both Piazza and Piazzetta at an angle, but

"any doubt as to which field, orthogonal or oblique, should operate in the square, is resolved by the floor paving, which… directs the space, obliquely, towards St. Mark's [Basilica]" (Baker, 1989, p. 146). Many designers faced with such a long space would tend to de-emphasize the long axis. In this case, however, the importance of the Basilica is made clear and "the scale of the space is modulated and humanized" by the linear bands of pattern in the pavement (Carmona et al., 2003, p. 160).

Figure 4-39. The pavement of Piazza San Marco. At left, looking west from the top of the Campanile (photo by Dave Wang). At right, a closer view of the pavement (from Sammartini, 1999).

The squares and rectangles within the pattern bands follow an a-b-a-c rhythm, where the "a" modules are squares that dish slightly toward stone drains at their centers (Figure 4-39). The "b" and "c" modules are nested squares and rectangles. The rectangles have roughly golden section proportions (1:1.6) in the Piazza, and 1:2 proportions in the Piazzetta. The dark gray paving stones are laid orthogonally in the framework of the bands, but diagonally within the squares and rectangles, as well as in the pavement outside of the patterned bands.

The squares and rectangles of the pattern may have been used to delineate market stalls at one time, or to refer to their former presence on the plaza (Samona et al., 1970). An inscription in the Piazza's stones (Figure 4-40), "*per l'arte de calegheri*" (for the art of the

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shoemaker) is dated 1625, which is almost a hundred years before the 1723 date attributed to

the Tirali pavement design. This was not mentioned in the literature surveyed, nor were any

other pavement inscriptions noted by the author. The shoemakers' guild was a powerful

force in the Venetian economy (Mack, 2002), and it is possible that it sponsored

improvements to the plaza that were recognized in this way, or that the shoemakers' market

stall traditionally occupied this spot.

Figure 4-40. An inscription *"per l'arte de calegheri"* (for the art of the shoemaker), 1625. (author)

Several personal or tourism-oriented Websites (http://users.swing.be/dauginetl, for

one) state that Tirali based this paving pattern on a popular carpet design of the time. While

this idea was not encountered in the scholarly literature, it is plausible. One of the main

luxury goods imported into Venice was the Oriental carpet (Mack, 2002). These carpets

were extremely popular in the city, serving as both a symbol and a source of its wealth.

"Ostentatious public display of Oriental carpets was especially significant in Venice, where

they were a highly profitable re-export commodity and symbolized the Republic's

commercial power and connections" (Mack, 2002, p. 77). Rasmussen (1959) describes how

the plaza was often decorated with carpets hung from upper windows during formal

processions, which were likely to have followed the patterned bands of the pavement. If

Piazza San Marco is the epitome of the outdoor room, it would be appropriate to decorate that room with a carpet.

Summary

Piazza San Marco functions as a threshold, or "a meaningful transition between the dense labyrinth of the city and the glittering expanse of the sea" (Norberg Schulz, 1980, p. 176). Seen as a point of departure rather than arrival, the plaza represents "a gateway to the Orient" (Mack, 2002, p. 11), and it contains elements of both Italy and the Far East.

Zimmerman (1999) studied the "liminality" of Venice and its expression in Venetian paintings (p. 47). She defines a liminal experience as "one that involves crossing a border or threshold. Such an experience can be physical or figurative" (Zimmerman, 1999, p. 47). There is an apparent repetition of that theme in the Piazzetta's role as a threshold to the Piazza, the Piazza as threshold to the city, and the city to the mainland. The formality and interiority of the plaza as a whole lends itself to a more specific interpretation of the Piazzetta as a foyer to the Piazza's living room, with the pavement serving as a beautiful carpet.

Both Mayernik (2003) and Zimmerman (1999) propose analogies of the Piazza as the nave of a huge cathedral, with the Basilica as its altar. This is also convincing, not only because the space served as the setting for religious rituals, but also because the floors of important Italian cathedrals, including the Basilica San Marco, were lavishly decorated with mosaic pavements (Williams, 1997).

Summary of case study findings

The following table and discussion summarizes the most commonly seen relationships between pavement, architecture, plaza, and context in the case studies. They are synthesized from the literature as well as the author's personal observations and opinions.

	Campo	Pio II	Campidoglio	San Marco
pavement to architecture				
repeating shapes, patterns, and proportions in adjacent architectural facades		●	·	·
delineating and/or connecting individual buildings or other structures	·	●	·	
repeating symbolic themes or metaphors in architectural facades		●	●	·
reinforcing or revealing the architectural hierarchy of the plaza	●	●	·	●
pavement to plaza				
defining a center or focal point for the plaza	●	·	●	●
defining or reinforcing the shape of the plaza's edge	●	●		·
relating center to edge and expressing the plaza's volume	●	·	●	●
defining and connecting the plaza's zones of movement or function	·	·		●
pavement to context				
relating to local transportation patterns, nodes, or landmarks	●	·	●	●
relating to local topography or other natural features	●	·	●	·
symbolically expressing historical or ideological foundations	●	●	●	
alluding to religious, cosmic, or universal concepts	·	●	●	

Table 1. Relationships between each case study's pavement and its architecture, plaza, and context.
Observations of stronger relationships are noted with larger dots.

Pavement to architecture relationships

The principle of repeating colors and materials in adjacent architecture is basic to paving design, and is covered in most current design guidelines. Not as commonly mentioned is the idea of repeating architectural shapes, patterns, or proportions in a pavement, which seems fundamental to the goal of visually relating the two, and which was observed in three of the case studies. This repetition may also direct attention to architectural features, such as strong vertical façade elements, that might otherwise go unnoticed. "The designer sees the whole building," but a person on the plaza tends to focus on "what is going on at eye level" (Whyte, 1980, p. 26). Functionally significant building components such as doorways are also pertinent to emphasize in a paving pattern.

The edges of buildings are visually and socially important. In Piazza Pio II, the light travertine lines of the pavement outline the major building footprints and frame their doors. Booth (1983), Booth and Hiss (2002), and Kirkwood (1999) mention the idea of aligning the pavement's pattern or joint lines with the corners or edges of buildings. The physical relationships between separate buildings can be clarified by applying this simple rule. In the case of Piazza Pio II, grid lines and brick insets visually connect two of the five buildings to the plaza, even though they are separated from the other buildings by a street that is paved in a different material. Waite (1998) analyzed building edge conditions on plazas to find the façade configurations that best support the use of public space. He found that colonnades and arcades (present to some degree in all of the case studies) were the most effective edge typologies from a social standpoint (Waite, 1998). In the Campidoglio and San Marco, the arcade floors are beautifully paved in styles that are distinct from the main plaza, but integrated by their related colors, materials, and patterns.

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Architectural forms are laden with symbols, and the pavement designer can select

from those to conceptually tie buildings to the ground plane and to strengthen the meanings

embedded in both. Expressions of order, power, and rhythmic ritual in the architectural

facades on piazzas Pio II, Campidoglio, and San Marco are reinforced by their repetition in

the pavement.

In the case of the Campo, it is not individual building facades that contain symbolic

meaning so much as their hierarchal relationships. The residences lining the curving wall of

the Campo have a unity based on their enforced similarity, and they contrast to the City

Hall's mass and its tower. The pavement lines reinforce this idea by connecting the

residences like spokes of a wheel to its hub in front of City Hall. Architectural hierarchy is

expressed by sheer mass to some extent, but even subtle cues, such as Piazza Pio II's

apparent reflection of the cathedral's façade in its pavement, can strengthen the apparent

status of a certain building in a group. Axes of movement reinforced in the pavement, such

as in the Campidoglio and San Marco, also direct attention to the starring building.

Pavement to plaza relationships

All four case study plazas have strong centers; in the Campo, it is physically at one

edge but it still functions as a focal point. In San Marco, the centers of the Piazza and

Piazzetta are linear bands, which are framed by the pavement pattern; where the two spaces

intersect, the borders drop away to frame a primary center to the whole configuration.

All four plazas also have a relatively high degree of enclosure, which is not typical of

modern American plazas. The edge of a plaza, and therefore the edges of its buildings and

pavement, are perceptually important areas for defining and containing space. "The most

basic expression of spatial design is the tension between inside and outside, between center

and edge, between container and being contained" (Benzel, 1998, p. 16). Since seating and social activity is usually concentrated along the edges of a plaza (Gehl, 1987), that pavement may be seen and examined more closely. Ashihara suggests using a higher quality of paving at the edges of spaces because "an examination of the edges… tells of the finish of streets and plazas as a whole" (1988, p. 108). Pavement that emphasizes the edge of a plaza, as in the level gray strip bordering the Campo, can clarify its shape and make its layout more legible, as well as perceptually holding it together as a place.

In the Campo and Pio II, the edges of slightly irregular spaces are connected to their centers by lines in the pavement. This has the effect of not only regularizing those shapes, but also pulling them together toward an emphasized center. Center-to-edge links can draw attention to the volume of space contained by a plaza, particularly when the centers coincide with strong verticals. The convex floor of the Campo may be perceived as the base of a vertically halved sphere because the converging lines focus attention toward the tall tower of City Hall, which perceptually defines the top of a curving roof, completing the spherical effect. The Campidoglio's domed pavement defines the volume of the plaza mainly by the intrusion on that space by the hill rising beneath the pavement. The paving pattern of San Marco points toward a center but stops at its periphery, deferring to the Basilica and Campanile to define a volumetric center in the interlocking space of Piazza and Piazzetta.

Zones of function, activity, or movement within a plaza are frequently mentioned in current literature on both plazas and pavement. The general implication is that they should be separated and distinguished with slightly different paving patterns (Beazley, 1960; Cooper Marcus and Francis, 1990). While that may be useful as a visual cue for wayfinding or other purposes, it could also fragment a plaza into parts. The diagonal nature of pedestrian paths

could also be problematic in a cohesive design, unless diagonality is a relevant theme. The Campo and Pio II have distinct pavements in circulation zones, along the edge of the Campo and in the street that bisects Pio II; but the light travertine lines in their pavement appear to connect, or extend across, those zones. The patterned bands of San Marco allude to the paths taken by religious processions through Piazza and Piazzetta, beginning and ending at the Basilica; modern visitors to the plaza tend to follow similar patterns of movement.

Pavement to context relationships

Local street patterns often influence a plaza's form, and can be reflected in its pavement as well. The Campo's position in Siena's curving streets, and Pio II's placement at a bend in Pienza's grid, are emphasized by lines in those pavements. The diagonal lines of the Campidoglio's pavement suggest that plaza's role as a significant node in the diagonal street network of Rome, and its elliptical shape may be a reference to the Colosseum, another important node. The bands of pattern in San Marco's Piazzetta connect the Grand Canal to the plaza, and point to the street connecting San Marco to the Rialto Bridge, a major landmark of Venice. The linearity of that plaza's form suggests the canals of Venice, and the double bands of its paving pattern resemble the rippled wake of a passing gondola.

A city's street patterns may in turn be influenced by its topography, which can be accentuated in a paving design: in the Campo, the travertine stripes running along fall lines emphasize the bowl shape of the plaza floor and its location in a natural saddle between ridges. In the Campidoglio, the paving pattern appears stretched by the force of the rising hill. Bacon describes a recurring theme in great Medieval and Renaissance plazas "in which there is a direct and purposeful design extension from the central square to an outward point where it clamps onto an expression of the forces of the region" (1967, p. 98). This might be

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a landform, water feature, or simply a view of the surrounding natural landscape. A design that recognizes the natural features of a region may evoke deeper meanings than one based on man-made structures or formal artistic principles (Hough, 1990; Norberg-Schulz, 1980).

An element as humble as pavement can reinforce a plaza's symbolic or historic role in its local context, or in the case of the Campidoglio, in the world. The Campo's role as a sheltered gathering space for Siena, and San Marco's as the threshold to Venice, are reflected in their pavement designs. The ideological foundations of Siena and Pienza are expressed in such simple forms as converging lines, a grid, and a circle. The struggle between religious and secular powers in Rome can be read in the diagonal lines and distorted forms of the Campidoglio's pavement. Any historical reference contains within it the concept of time; with that may come "an understanding that time is a defining dimension of existence, particularly the existence of living things" (Kunstler, 1996, p. 89). Recognizing common threads that connect past to present is an important part of human experience. "Chronological connectivity lends meaning and dignity to our little lives. It charges the present with a more vividly conscious validation of our own aliveness. It puts us in touch with the ages and with the eternities, suggesting that we are part of a larger and more significant organism" (Kunstler, 1996, p. 89).

Religious or cosmic interpretations were encountered in many published architectural analyses of the first three case studies, and their pavements also carried these themes. They are expressed in images such as the cape of the Virgin covering the Campo, references to heaven and hell in Piazza Pio II's cathedral window and pavement ring, and the navel of the world in the Campidoglio's swirling ellipse. These are powerful ideas that might not be interpreted by the average observer. Nevertheless, their expression adds a layer of meaning

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to these pavements that transcends any functional or visual considerations. That meaning is consistent with the plaza as a whole and its relation to its context, and it makes functional concerns such as wayfinding seem trivial by comparison. In a culturally and spiritually diverse society like ours, religious references might not be as appropriate as allusions to nature, the cosmos, and other concepts fundamental to the human experience. For example, natural cycles might be recognized by a paving pattern's interaction with the shadows cast on it, or other effects of changing light or weather conditions in the course of a day or year.

Summary

Perhaps the most important aspect of the depth and range of meaning found in these paving designs is that they reward repeated viewing and an open mind. A regular visitor to these plazas might find a different meaning on each occasion, depending on their state of mind or even their stage of life. None of the four paving designs are literal or obvious translations of a single concept, or understandable at a glance. They express profound and universal concepts which are relevant to any society or any individual, and which have the capacity to deepen over time.

Although the designs of all four case study pavements were influenced by ideas reflective of their period of design, none would be out of place in a modern setting or another culture. This is not to say that the style of the Italian piazza in general could be easily applied to a modern American plaza, but the design ideas behind their pavements appear to be transferable.

CHAPTER FIVE

PAVING DESIGN GUIDELINES

Four case studies of excellently designed plazas, which were perceived as integrated, were analyzed for evidence of connections between elements at the scales of pavement, architecture, plaza, and context. These connections were found in the forms and other tangible qualities of the elements, but also in the resulting meanings that might be derived from those forms by a person spending time in the plaza. The focus of this analysis was on the pavement, but the relationships between the four scales of analysis were as important as the design of the pavement itself.

The following guidelines were derived from the relationships noted in the case study analyses, which were abstracted and simplified in order to facilitate their application to contemporary design. It should be emphasized that they are intended to build on the functionally driven guidelines in current literature, and not to replace them.

Design guidelines for pavement in public plazas

The case study observations listed in Table 1 on page 90 were converted into guidelines simply by changing the form of the verbs, as in the following list. A discussion and illustration of the guidelines, using contemporary paving designs, follows.

Pavement to architecture

- Repeat shapes, patterns, and proportions in the adjacent architecture.

- Delineate and/or connect individual buildings or other structures.

- Repeat symbolic themes or metaphors in architectural facades.

- Enhance or reveal the architectural hierarchy on the plaza.

Pavement to plaza

- Define a center or focal point for the plaza.

- Define or reinforce the plaza's edge.

- Relate the plaza's center to its edge and express the plaza's volume.

- Define and connect the plaza's zones of movement or function.

Pavement to context

- Relate to local transportation patterns, nodes, or landmarks.

- Relate to local topography, water features, or natural processes.

- Express historical or ideological foundations of the plaza.

- Allude to religious, cosmic, or universal concepts.

It should be noted that the majority of the following pavement examples are positive models of the specific guideline that they accompany. However, they are not necessarily excellent designs in every sense, or located in integrated plazas; in fact, two are not in plazas. The focus here is on the guideline itself and its illustration. Three negative examples are included because they are vivid demonstrations in themselves of designs that do not appear to have integration of the space as a primary goal.

- *Repeat shapes, patterns, and proportions in the adjacent architecture.* The small neighborhood plaza in Figure 5-1, located in a rather poor neighborhood of Vancouver, B.C., is very simply and economically paved in asphalt and brick in a pattern of overlapping circles. The pavement very effectively relates to an adjacent brick building with arched windows, as well as to the plaza's circular planters and tree wells.

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Figure 5-1. Vancouver, British Colombia, Canada. (author)

- *Delineate and/or connect individual buildings.* Seattle's Westlake Park, Figure 5-2, has
an attractive paving pattern derived from a basket woven by the Salish tribe that occupied
the area. However, the angles inherent to the pattern have a confusing effect because
they don't seem to relate to any of the building footprints, and they intersect with walls at
awkward angles. The pattern appears to slide under the buildings, or to be cut off as if it
were a sheet of patterned linoleum. A border transition from pavement to façade, even if
it resulted in the same angles at its edge, would more effectively relate the two. This
pattern dominates the space so strongly that it seems that the buildings and streets, rather
than the paving pattern, are misaligned.

Figure 5-2. Westlake Park, Seattle, Washington. (left photo by author; right photo from CityDesign, n.d.)

- *Repeat symbolic themes or metaphors in the adjacent architecture.* The plaza pavement in Figure 5-3 (also seen in Figure 2-9) was designed by Tess Jaray, a British abstract painter. This historic cathedral, like most religious buildings, has many symbols in its façade. A cross is simplified and repeated in the pavement in front of the cathedral; adjacent streets are paved in the dash pattern visible at the bottom of the right photo.

Figure 5-3. Wakefield Cathedral District, Wakefield, England. (from Williams, 2000)

- *Enhance or reveal the architectural hierarchy on the plaza.* An important colonial cathedral on an Argentine plaza (Figure 5-4) was surrounded by modern buildings and not distinguished in any way until this pavement was designed by Miguel Angel Roca. An elevation drawing of the cathedral is outlined in the pavement, making the cathedral's status clear and directing attention to its architectural details.

Figure 5-4. Plaza de Armas, Córdoba, Argentina. (from Roca, n.d.)

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- *Define a center or focal point for the plaza.* This paving design by Bjørn Nørgaard (Figure 5-5) might have been impossible without the aid of a computer. The pattern, although it appears to be regular in the upper half of the left photo, changes subtly as it approaches and frames the large historic fountain, which is the focal point of the plaza.

Figure 5-5. Amagertorv Plaza, Copenhagen, Denmark. (from Topos, 2000)

- *Define or reinforce the plaza's edge.* This small plaza (Figure 5-6), designed by Maggy Howarth, has a simple but colorful center and an intricately paved edge. Whorls in the paving pattern are precisely centered on the bollards, which also serve to define the edge and to protect the pedestrian space from auto traffic.

Figure 5-6. Whitehaven, England. (from www.maggyhowarth.co.uk)

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- *Relate the plaza's center to its edge and express the plaza's volume.* The plaza in Figure 5-7, like that in 5-3 above, was designed by Tess Jaray, Subtle changes in the paving pattern from the plaza's center to its edge give an impression of expanding and contracting, not unlike the Campidoglio case study. When these trees have matured, the central space will be quite contained, but not disconnected from the periphery.

Figure 5-7. Midlands Art Centre, England. (from Williams, 2000)

- *Define and connect the plaza's zones of movement or function.* A street that formerly separated London's Trafalgar Square (Figure 5-8) from the National Gallery was recently closed to connect the two pedestrian spaces. The left-hand photo shows a portion of the original plaza, with very restrained but beautiful designs in the older pavement surrounding the fountains. The right-hand photo shows the new pedestrian area designed by Norman Foster. Although the York stone used for paving is of very high quality, the impression from any distance over 5 feet is not unlike a blank expanse of concrete. The end effect is that this area still looks like a street, and not a pedestrian plaza. It also has very little relation to the older portion of the plaza, to the portico fronting the National Gallery, or to the pedestrian flow between them.

Figure 5-8. Trafalgar Square, London, England, with the newly pedestrianized area at right. (author)

- *Relate to local transportation patterns, nodes, or landmarks.* Freedom Plaza (Figure 5-9) was designed by Robert Venturi and Denise Scott Brown. A map of L'Enfant's original plan for Washington, D.C. is inset in the paving stones. Quotes about the city and its famous residents are engraved in the white stones. Adding to the other weaknesses of this plaza, its paving design is a rather literal translation of a simple idea, with very little depth or room for interpretation; it is also laid out at a scale that can't be read as a map.

Figure 5-9. Washington, D.C. (left, from Duany et al., 2003; right, from http://pubs.usgs.gov/gip/stones)

- *Relate to local topography, water features, or natural processes.* Roberto Burle Marx's famous pavement for the edge of Copacabana Beach in Rio de Janeiro (Figure 5-10) is strongly patterned but pleasantly rhythmic, and appropriate for a beach setting. Two other bands of patterned pavement just inland from the wave pattern cover a boulevard and a deep sidewalk. These patterns were designed to be seen from the windows of the tall buildings just visible at the edge of the left photo.

Figure 5-10. Cobacabana Beach, Rio de Janeiro, Brazil. (left, from *The Gardens of Roberto Burle Marx*, 1991; right, from http://fotolog.net/pikyto)

- *Express historical or ideological foundations of the plaza.* When public funds will not cover their construction costs, plazas are sometimes built using private donations, which are recognized by custom-engraved pavers as in the left photo of Figure 5-11. This personalizes the plaza and reinforces the idea that each citizen, whether or not they contributed to that fund drive, owns a part of every public space. The right photo is from a sculpture garden by Niki de Saint Phalle in Italy. The pavement throughout the complex is patterned, and this path contains a very personal handwritten statement by the artist about the sculpture garden and its meaning to her.

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Figure 5-11. At left, pavers engraved with personal messages, location unknown (from www.fotolog.net/pavement_pix); at right, the Tarot Garden, Capalbaio, Italy. (author)

- *Allude to religious, cosmic, or universal concepts.* Fiber optic lights are embedded in the concrete pavement of a plaza designed by Maya Lin (Figure 5-12). The lights, which appear to be randomly scattered and sized, are in the configuration of stars in the midnight sky over the city at the turn of the millennium. The plaza is flooded in the winter to use as an ice skating rink, and the ice is illuminated by the same lights.

Figure 5-12. Grand Rapids, Michigan. (left, from *Landscape Architecture* magazine, April 2002; detail drawing at right, from www.CGarchitect.com)

CHAPTER SIX

CONCLUSIONS

In urban public space, it could be argued that the first responsibility of landscape architects and urban designers is to create functional spaces that enable a variety of activities and serve the public. Aesthetic design is normally the second consideration after functionality. Public space that has achieved these two design goals is generally seen as successful on the part of the designer. However, designers have the ability and the responsibility to create public spaces that are more than just functional and beautiful – they can and should be contextual, memorable, and meaningful. A plaza can serve as a landmark in space and time, reflect a city's identity, and instill civic pride in its residents. If it enables another dimension of experience, one that relates a person to their society, city, and history, it can become a meaningful place – and not simply a showcase of the designer's talents.

There are dozens of factors that contribute to a plaza's success or failure as a public space. Pavement is only one of those, and it is not implied here that it is the most important, or that it could make or break a plaza. However, it has tremendous potential as an element that supports the perception and experience of the plaza as an integrated whole, which in turn can foster a deeper level of meaning to the end user of that plaza. In order to contribute to the integration of a plaza, a pavement should relate to the other elements of that plaza and its contextual setting. Current paving design guidelines have a rather shallow quality that appears to be rooted in practical or neutral attitudes toward pavement, or even toward the architecture that surrounds it. The supplemental guidelines presented in this study are not intended to stand alone, but they may be conceptual starting points for contemporary designers of plaza pavements which have the goal of integration.

It appears that the first three of the case study pavements were designed at the same time, and perhaps by the same person, as the plaza. That would certainly give them an advantage in being integral or integrating elements in the finished product. Modern plazas are often created from "leftover space" between existing buildings, and their paving designs may be after-the-fact additions that are unlikely to pull a group of buildings into a whole. Consideration of a plaza's paving design, and involvement of the pavement designer, early in the plaza design process is an important factor in achieving integration.

Limitations

The most serious limitation of this study is the place and time of these four plazas' designs: Italy, from the 14th to 18th Centuries. As mentioned previously, this can also be seen as a strength of the case studies individually and as a group, in terms of their quality of design. However, the question of whether the lessons learned from historic precedents can be applied to present-day American public space is controversial.

There appear to be good reasons for the volumes of analysis and critique of the Italian piazza in general. It has a timeless and universal appeal, owing in part to its integrated nature, that is rare in modern plazas. Previous attempts to transfer certain aspects of piazza design to American settings have been less than successful. For example, the plaza of Boston City Hall, widely recognized as a complete design failure, was inspired by the form of the Piazza del Campo, the first case study in Chapter Four. Not only was the Boston plaza several times the size of the Campo, it lacked the Campo's central location, its enclosure, its climate and microclimate, and the charm of its architecture, not to mention its paving pattern. Several other American plazas have attempted to superficially copy certain elements of the Italian piazza – for example, its carved stone fountains or rustic paving materials (often

simulated by stamped concrete) – and the end results tend to look like "theme park" environments with very little relation to their surroundings.

The author does not advocate the American import of the *style* of the Italian piazza but the *substance* of its design, which is characterized by an integration of its parts into a whole. The principle of integration is applicable to plazas of any historic period or culture, including modern American plazas. This study did not analyze the integration of modern plazas in order to compare the findings, but their pavements were examined according to the criteria drawn from the case study analysis.

Suggestions for further research

Pavement is a worthy field of research for landscape architects, urban designers, or even public artists who choose it as a medium. The notion that it is simply a practical surface, or a neutral background for architecture, has kept it from being approached with the same interest and creativity as many other designed elements of the urban landscape.

The quality of these case study pavements was related in part to their materials, which are relatively expensive now. In times of tight budgets for public space, one area of research that merits attention is low-cost paving materials and how they can be used effectively and creatively. Concrete is here to stay, but it doesn't have to be nearly as cold and dull as it naturally is, as garish as recent trade publications would have it, or a poor imitation of any other material. Recent developments such as light-transmitting concrete show great potential as modern paving materials that can serve a dual purpose. The lowest-cost paving material, asphalt, is so ubiquitous in the urban scene that it has connotations of car-centered environments, sprawl, and other urban design problems. However, it has a springy tactile quality that is much more sympathetic to the feet than concrete, and warrants some

exploration as pavement for pedestrian areas. New or experimental paving materials are another potential area of study, which might be driven by a focus on local or recycled materials, permeability, or other sustainability issues.

Further research into the visual effects of paving patterns could be structured as a visual preferences survey, gauging the viewer's response to various paving patterns in digitally retouched photos. The following pairs of photographs of the case studies, with the actual plaza on the left and a retouched photo on the right, give some indication of the impacts that these pavements have on the plazas they occupy, and how the substitution of one pattern into another plaza would weaken or confuse the message of the entire design.

Figure 6-1. Piazza del Campo, Siena. (author, retouched by author)

Figure 6-2. Piazza Pio II, Pienza. (author, retouched by author)

Figure 6-3. Piazza del Campidoglio, Rome. (photo by Dave Wang, retouched by author)

Figure 6-4. Piazza San Marco, Venice. (photo by Dave Wang, retouched by author)

Many topic areas relevant to landscape architecture and urban design could be approached using a concept of links or connections, as this study did. The topic of pavement, and its relation to the perception of integration, took this research along many unplanned and interesting paths. Some were dead ends, and others simply disappeared into the fog, but many of them circled back in a satisfying way. In the words of Charles Eames (Powers of Ten, n.d.), "Eventually, everything connects."

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