"The Corner of Avenue A and Twenty-Third Street": Geographies of Street Numbering in the United States

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The designation of streets by number is one of the hallmarks of North American urbanism, yet very few studies have examined the geographies of street numbering in U.S. cities and towns. This article provides one of the first comprehensive, nationwide assessments of the spatial distribution of street numbering and lettering practices across the United States. Drawing on data collected from Google Maps, census records, state almanacs, and related sources, we analyze the proportion of incorporated places in all fifty U.S. states that have adopted some form of street numbering or lettering; the regional variation in the prevalence of alphanumerical systems of street designation and the relationships between the occurrence of street numbering, population size, and date of incorporation. In doing so, the broader aim of this study is to undertake the empirical groundwork needed to develop a more nuanced critical theory of the social production of calculable space. **Key Words: calculable space, grid, spatial inscription, street numbering, urban toponymy.**

用数字指派街道，是北美城市主义的里程碑之一，但鲜少有研究检视美国城镇的街道编号地理学。本文对全美以数字编号及字母编排街道的空间分佈，提供其中一个全面性、全国性的最初评估。我们运用搜集自谷歌地图、普查资料、各州年鑑，以及相关资源的数据，分析全美採取以数字编号或字母编排街道的某种形式的五十州之中，注册为治理单位的地方之比例；盛行以字母系统指派街道的区域变异，以及街道编号的出现、人口规模和地方注册日期之间的关联性。本研究这麼做的更广泛目的在于，为了对社会生产的可计算空间建立更细緻的批判理论，着手进行所需的经验性基础工作。 关键词: **可计算的空间，网格，空间铭刻，街道编号，城市地名研究。**

La designación de calles con números es uno de los distintivos del urbanismo norteamericano; no obstante, muy pocos estudios han examinado las geografías de la numeración de calles en las ciudades y pueblos de los EE.UU. Este artículo provee una de las primeras evaluaciones amplias de la distribución espacial de prácticas de numeración y diseño de placas para identificar las calles a través de los Estados Unidos. Con base en datos generados de los Mapas de Google, registros censales, almanaques del estado y fuentes relacionadas, analizamos la proporción de lugares incorporados en todos los cincuenta estados de los EE.UU. que han adoptado alguna forma de numeración o designación de calles; la variación regional en la prevalencia de sistemas alfanuméricos para la designación de calles; y las relaciones existentes entre la ocurrencia de la numeración de calles, el tamaño de la población y la fecha de incorporación. Haciendo esto, la meta mayor de este estudio es emprender el trabajo empírico de base que se necesita para desarrollar una teoría crítica más matizada sobre la producción social del espacio calculable. **Palabras clave: espacio calculable, cuadrícula, inscripción espacial, numeración de calles, toponimia urbana.**

> Judging by the names given to our streets, we Americans might be considered the least aesthetic people in the world. Nowhere else is there such a general regard, in that respect, for system and convenience, at a sacrifice of every other consideration. Such a locality as "the corner of Avenue A and Twenty-Third Street" is almost as distinctively American as Algonkin and Iroquois names like Mississippi and Saratoga. … Our habit of depending for street titles on mere alphabetic and numerical signs may react on us in a way that is not advantageous. We are quite practical and prosaic enough now, and anything that tends to make us more so is not a thing to be desired.
>
> —William W. Crane, "Our Street Names" (1897, 264)

In an essay published in *Lippincott's Monthly Magazine* at the end of the nineteenth century, commentator William Ward Crane criticized the prevailing orthodoxy of using numbers and letters to designate city streets throughout the United States. "The result," he wryly remarked, "is that many of our city maps look like a mixture of the English alphabet and the multiplication-table, with a few proper names thrown in to relieve the monotony" (Crane 1897, 264). The identification of streets by means of number or letter, it seemed, was a direct affront to the moral character and aesthetic judgment of the nation, because "to conceive anything like patriotic devotion to a vowel, or ardent enthusiasm over a decimal fraction, would require a more active fancy than most people possess" (Crane 1897, 265). What was needed, Crane insisted, was a renewed commitment to "culture and taste" and thus a rejection of the "business

The Professional Geographer, 68(1) 2016, pages 39–52 © Copyright 2016 by American Association of Geographers.
Initial submission, July 2013; revised submission, July 2014; final acceptance, July 2014.
Published by Taylor & Francis Group, LLC.

methods" of street numbering that had so profoundly shaped the spatial organization of cities throughout the country.

Given the prevalence of numbered streets in the United States, street numbering is often viewed as a distinctly "American system" of urban spatial organization (Vuolteenaho 2012). However, the numbering of streets long predates the European settlement of the Americas, and there are currently cities with numbered streets on every continent around the world with the exception of Antarctica.[1] Street numbering is therefore a global phenomenon, but no other region surpasses North America in the use of street numbers as a means of spatial identification. Although such practices have played a key role in the production of urban space within the United States, very little scholarship has explored the geographies of street numbering as a central feature of North American urbanism (yet, see Mencken 1948; Stewart [1945] 1967; Baldwin and Grimaud 1989; Rose-Redwood 2008a).

This study provides one of the first comprehensive assessments of the spatial distribution of street numbering in all fifty U.S. states from a historical–geographical perspective. Our primary aim is to offer a spatiotemporal analysis of street numbering and lettering patterns in the United States to further enrich the empirical basis of the literature on the "geographies of mathematization and calculation" (Crampton and Elden 2006, 681). With a certain degree of irony, we employ conventional quantitative methods to examine the extent to which the calculative techniques of enumeration have themselves served as a means of intervening in the world-making practices of city building and the performative enactment of urban imaginaries.

In doing so, our goal is not to decode the hidden meanings or intentions that lie behind the adoption of street numbering systems in different contexts. Elsewhere, one of the current authors has shown the limitations to such a "game of interpreting founding intentions" (Rose-Redwood 2011, 409), and we are not convinced that it would yield fruitful results if applied to our analysis in the present study. There have certainly been different rationalities at play in the adoption of street numbering as a mode of spatial organization, from the governmental desire for spatial legibility to the real estate developer's penchant for replicating uniform models of urban development (Scott 1998). Additionally, the adoption of the U.S. Township and Range Survey System in 1785 played a pivotal role in establishing the use of the coordinate grid as a framing device to facilitate the westward expansion of European settlement across North America (Linklater 2002). A thorough historical analysis would also have to take into account how the professionalization of municipal engineering and planning was instrumental to the standardization of methods for street and house numbering during the nineteenth and twentieth centuries (Rose-Redwood 2008a).

In this article, however, we have our sights on the more modest goal of enumerating the spaces of enumeration through a geographical analysis of the distribution of alphanumerical street naming systems in the United States. Our primary concern is not so much to determine whether these enumerative regimes were consciously designed to render space calculable but rather to trace the effects that these calculative techniques of spatial enumeration have had in (re)constituting the streetscapes of cities and towns across the country. Various geographical studies have explored the political genealogy of calculable space, in terms of both its historical emergence and contemporary political effects (Elden 2005, 2006, 2010; Crampton and Elden 2006; Huxley 2008; Hannah 2009; Tantner 2009; Crampton 2011; Cicchini 2012; Harris and Lewis 2012; Rose-Redwood 2012a, 2012b; Rose-Redwood and Tantner 2012; Norman 2013). The current study contributes to this literature by turning the calculative gaze back on itself to quantify the influence that "number" has had in the production of actually existing calculable spaces. Number, in this case, is both our primary object of analysis as well as a methodological tool to investigate the geographies of mathematization and calculation.

By examining the role that street numbering and lettering have played in the making of regimes of spatial inscription, this study also contributes to the field of critical toponymy (Berg and Vuolteenaho 2009), particularly the growing body of literature on the politics of street naming (Palonen 1993; Azaryahu 1996; Yeoh 1996; Alderman 2000; Augustins 2004; Light 2004; Rose-Redwood 2008b; Bigon 2009; Adebanwi 2012; Alderman and Inwood 2013). Such works have primarily focused on the ways in which street naming is enmeshed in wider circuits of social and political power and how the naming of streets has served as a strategy for inscribing collective identities and historical narratives into urban spaces. In this study, we seek to broaden the scope of urban toponymic scholarship by considering the linkages between street naming and the geographies of mathematization.

Because it is widely assumed that the vast majority of U.S. cities have street numbering systems, we put this assumption to the test by documenting the percentage of incorporated places in the United States that have numbered and lettered streets. Next, we analyze patterns of regional variation in the spatial distribution of street numbering across the country as well as the relationship between population size and the prevalence of street numbering. We then assess temporal trends in the adoption of street numbering as a technique of urban spatial organization and conclude with an interpretive discussion of the results.

Street Numbering and the Spaces of Enumeration

The designation of streets by number is one of the hallmarks of North American urbanism (Mitchell

1990). By the term *street numbering*, we refer to the use of numbers to identify individual streets within a street naming system (1st Street, 2nd Street, 3rd Street, etc.). The practice of street numbering is related, yet distinct from, the numbering of buildings (house numbering) as well as the use of numbers to designate parcels of property (cadastral numbering). In the North American context, a *street address* typically consists of a house number and street name that together serve as the basis of a geo-locational regime of spatial identification. The numbering of buildings and naming of streets have both been key strategies of urban spatial ordering in the United States since the eighteenth century (Rose-Redwood 2012b), and many U.S. cities have taken the practice of spatial enumeration one step further by adopting numerical conventions for the naming of streets as well. The use of numbers or letters as street names provides a means to systematize street nomenclature so that the relative location of one street can be measured by its position within a numerical sequence. This has the effect of entrenching the logic of enumerative calculation within the very fabric of the landscape itself, thereby naturalizing a Cartesian conception of space as calculable and enumerable.

One of the first attempts to situate the practice of street numbering within a broader historical context appears in Stewart's ([1945] 1967) classic study, *Names on the Land: A Historical Account of Place-Naming in the United States*. In it, Stewart maintained that there are "four basic patterns of American street-names, more or less associated with different great cities, which served as models" (244). Many early colonial cities, such as Boston, adopted street names without any reference to a numerical system of street nomenclature.[2] Stewart argued, however, that the most widespread pattern of street naming in the United States is the Philadelphia plan (1682), consisting of a grid layout with numbered streets in one direction and named streets in the opposite direction.

Another well-known model for street naming is that of Washington, DC (1791), which is divided into four quadrants (NW, NE, SW, SE) with the U.S. Capitol building at its center. The Washington plan combined street numbering with the lettering of perpendicular cross-streets (A Street, B Street, C Street), along with avenues cutting through the grid named after different U.S. states. As Stewart observed, far fewer cities adopted the Washington plan but, in certain respects, both the Philadelphia and Washington models influenced New York's street plan (1811), the layout of which was composed of numbered east–west streets and numbered north–south avenues as well as a small section of lettered avenues on the Lower East Side colloquially known as Alphabet City. Stewart ([1945] 1967, 248) argued that the New York plan was "the ideal of practicality," but the Philadelphia model was more widely emulated because it served as a "compromise" between the utility of numbers and the symbolic value of names.[3]

Stewart estimated that "[m]ore than half of all our towns [in the U.S.], perhaps three quarters of them, have a system of numbered streets" ([1945] 1967, 248). The majority of these cases, he suggested, followed the Philadelphia model, whereas an estimated 17 percent of cities adopted the New York plan and only 10 percent contained the lettered streets of the Washington system. Unfortunately, Stewart did not explain the methodology that he used to make these estimates apart from noting that it was "chiefly based upon the direct study of street-name plans in the older sections of our cities" ([1945] 1967, 471). It is therefore unclear which cities, and how many maps, served as the basis of Stewart's observations, but his findings nevertheless provide an intriguing first step toward offering an account of the geographies of street numbering in the United States.

Since Stewart's *Names on the Land* was first published in 1945, virtually no geographical scholarship has critically reassessed his analysis of street numbering patterns in the United States (yet, see Mencken 1948). With the exception of technical manuals and studies written for civil engineers and city planners (Corwin 1978), as well as government reports (U.S. Census Bureau 1993), one of the only other systematic studies of street numbering in the United States is Baldwin and Grimaud's (1989) comparative analysis of street naming practices in four western states (Montana, North Dakota, South Dakota, and Washington) and one northeastern state (Massachusetts). Using data from the U.S. Postal Service's carrier route tapes, they ranked the frequency of the top fifty street names in each of the five states. Not surprisingly, among the top ten street designations used, all were numbers in the western states and all were names in Massachusetts, indicating the regional variation in street numbering patterns across the country and the influence of the grid-plan town in the West.

There has also been some limited research comparing street numbering in North America with other geographical contexts (Ziyu, Millward, and Bin 1983; Rama 1996; Hamlin 1999; Vuolteenaho 2012). For example, Vuolteenaho (2012) provided one of the first accounts of the spatial history of street numbering in Europe. He traced the use of street numbering in European cities as far back as the year 1281, with the English town of New Winchelsea as a likely candidate for "the oldest verifiable case of the sequential numbering of parallel streets in the whole of Europe" (Vuolteenaho 2012, 663). Although the use of street numbering as a technique of urban spatial organization is far less common in Europe than North America, Vuolteenaho clearly illustrated that cases of street numbering can be found in dozens of European cities.

Another important study is Rama's (1996) influential book, *The Lettered City*, in which he offered insightful reflections on the numbering of streets in Latin America as part of a more wide-ranging discussion of the "ordered city" (1). Inspired by the work of Foucault, Rama contended that, in Latin American

cities such as Bogotá, the use of the grid plan and numerical street addresses has produced a space that is "even more precise and rigid than Manhattan's and depends exclusively on numbers, allowing one to know in advance how to find addresses with a precision that includes street, block, and location on the block" (26). He argued that the advent of Cartesian analytical geometry—with its numerical coordinates and locational grid—resulted in a reconceptualization of mathematical space during the seventeenth century that has, in turn, had profound implications for the spatial organization of cities. To be sure, both the urban grid and street numbering predate the Cartesian revolution in mathematical thought (Akkerman 2001; Vuolteenaho 2012). Yet Descartes was nevertheless instrumental in formulating the modern conception of space as calculable by reducing questions of geometry to "problems of number" (Elden 2005, 12). We return to these interpretive questions after presenting the data, methods, and results of our analysis next.

Data and Methods

This study combines the pragmatic use of quantitative methods with a critical sensibility to interrogate how calculative rationalities of number have constituted the spatial worlds of everyday urban life.[4] In particular, we have compiled and analyzed a data set of street numbering patterns in all fifty U.S. states to assess the extent to which regimes of numerical inscription have been embedded within the U.S. landscape. The research team started collecting data in 2007, beginning by downloading a list of all incorporated places in the United States, along with demographic data, from the U.S. Census Bureau's Web site (U.S. Census Bureau 2007). After omitting duplicates and other miscellaneous information from the census data, we estimated that there were a total of approximately 22,930 incorporated places in the United States.[5] This list of incorporated places then served as the basis for our data collection efforts, and we proceeded to compile data related to street numbering for each place using the Google Maps online mapping application.

The first step was to conduct a search query for the place name of each locality using Google Maps. Each map depicted the street network of a given city or town, listing official street names as well as indicating how individual streets relate to the broader street system. Through a visual assessment of each map, as well as additional street name search queries, we input data into an Excel spreadsheet related to (1) whether a place had any numbered streets; (2) whether streets were numbered in only one direction (Philadelphia plan) or in more than one direction (New York plan); (3) the range and spatial extent of street numbering; (4) the use of cardinal-direction prefixes and suffixes (e.g., North 10th Street or 10th Street North); (5) the use of directional quadrants (NE, NW, SE, SW); and (6) the prevalence and range of lettered streets. In the case of small towns, collecting this geographical information was relatively straightforward, but it could be extraordinarily painstaking for larger cities.

For the purposes of this study, we omitted numbered highways (e.g., Route 6 or Interstate 95) and other roads that were not part of a local street plan. In some states, such as North Dakota, there are also regional street numbering systems, which do not always align with the street numbers of individual localities. In such cases, we excluded the regional system from our analysis unless it was used throughout a town. Additionally, there were numerous instances in which different sections of a city had seemingly autonomous street numbering systems. If there were north–south street numbers in one section but east–west street numbers in a different area, we classified the locality as having street numbers in more than one direction (New York plan). It was therefore important to distinguish localities with small pockets of numbered streets from those in which a single street numbering system encompassed the vast majority of the urban area.

After collecting street numbering data using Google Maps, the next step was to determine an appropriate metric for constructing a historical timeline to assess the rise and fall of street numbering as a spatial practice. The most relevant variable to use when developing such a timeline is the date that a given street numbering plan was adopted. With more than 20,000 places to consider, however, this level of detail would have required an inordinate amount of archival research. After weighing various options, we decided to use a place's date of incorporation as a proxy variable that would indicate when a city or town was officially recognized as an "incorporated place." This poses some interpretive difficulties, because the date of incorporation is not always the same as the date of initial European settlement, and neither of these dates might correspond with the date that a formal street plan was adopted. Of each of these three variables, however, the date of incorporation is the most readily accessible to acquire on a state-by-state basis and provides a useful, if rather crude, metric for tracing the temporal patterns of street numbering nationwide. Dates of incorporation were obtained from a variety of sources, including state almanacs. Once we finished collecting the data, we tabulated the total values for each variable by state, region, and the country as a whole. In the next section, we present our research findings, which provide one of the first comprehensive analyses of the geographies of street numbering in the United States.

Results

The Spatial Distribution of Street Numbering in the United States

As we tabulated the results for this study, one of the first questions that we sought to answer was whether

Stewart's ([1945] 1967) claim was correct that more than half of all U.S. cities and towns had a system of numbered streets. Given Stewart's speculations, it was quite intriguing to find that, based on our calculations, nearly half of all incorporated places in the United States have some form of street numbering system (49.6 percent, to be precise).[6] Of those places with numbered streets, 61 percent had street numbers throughout a significant portion of the downtown core, whereas the remainder (39 percent) only had numbered streets in a small section. Just as Stewart suggested, the vast majority of those places with street numbers had adopted the Philadelphia model of numbering streets in one direction (79 percent), whereas only 21 percent of all street numbering systems were based on New York's plan with numbered streets in more than one direction. In total, there were an estimated 8,985 incorporated places with numbered streets in one direction and 2,388 with street numbers in more than one direction (39.2 percent and 10.4 percent, respectively, of all incorporated places across the country). Because some version of the New York plan can be found in 10.4 percent of all places and in 21 percent of localities with numbered streets, Stewart's calculation that the New York plan influenced 17 percent of cities was clearly not too far off the mark. Even more remarkable is Stewart's estimate that around 10 percent of all cities had adopted a street pattern similar to that of Washington, DC. Our analysis confirms that 9.8 percent of all incorporated places in the United States have lettered streets and, similarly, 9.9 percent of places with numbered streets use directional quadrants. With respect to broad national trends, therefore, Stewart's account of the geographies of street numbering is surprisingly accurate given the limited access to cartographic materials available at the time.

There is a significant degree of regional variation in the spatial distribution of street numbering systems across the United States (Figure 1). Although half of all incorporated places have numbered streets nationally, different states vary substantially, with street numbers in only 6 percent of places in Vermont compared to 92.1 percent of cities and towns in Utah. In some states, virtually all street numbers are located in small sections of a town (e.g., Rhode Island and Vermont), whereas in other states, such as Utah, over 95 percent of street numbering systems cover a significant portion of a city. The case of Utah is particularly unique, given the history of Mormon-influenced town planning and the adoption of a variant of the New York and Washington plans in Salt Lake City—with

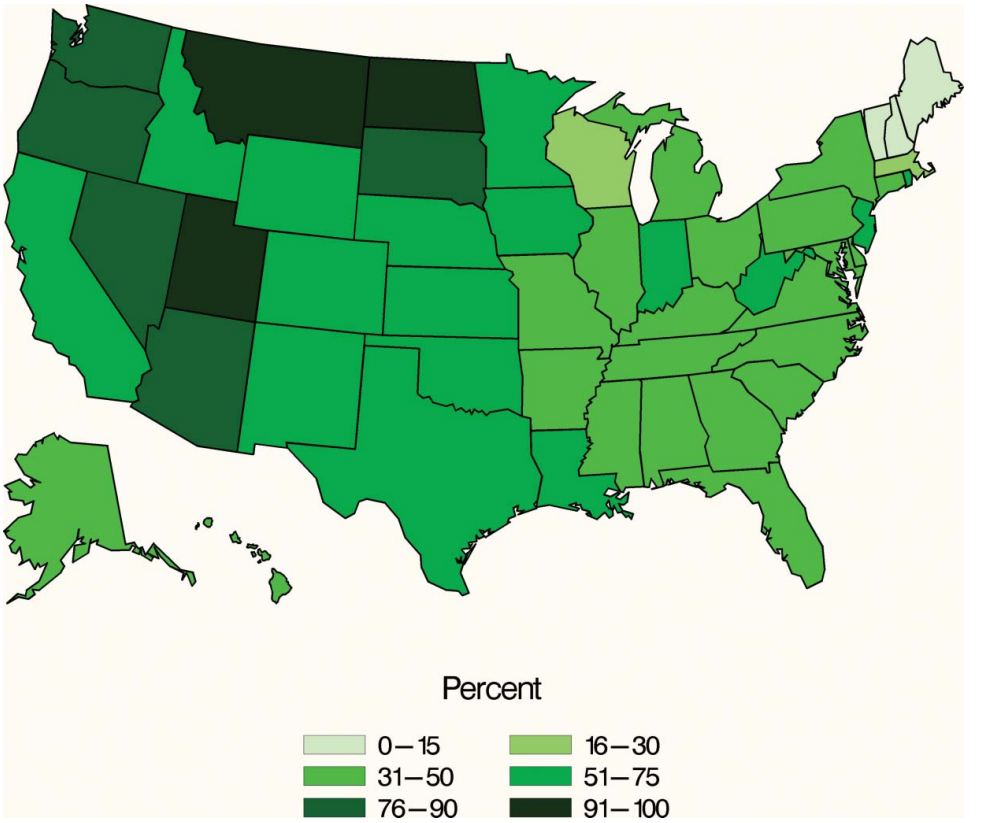

Figure 1 *Percentage of places with numbered streets in the United States. Source: Cartography by David Atkinson. (Color figure available online.)*

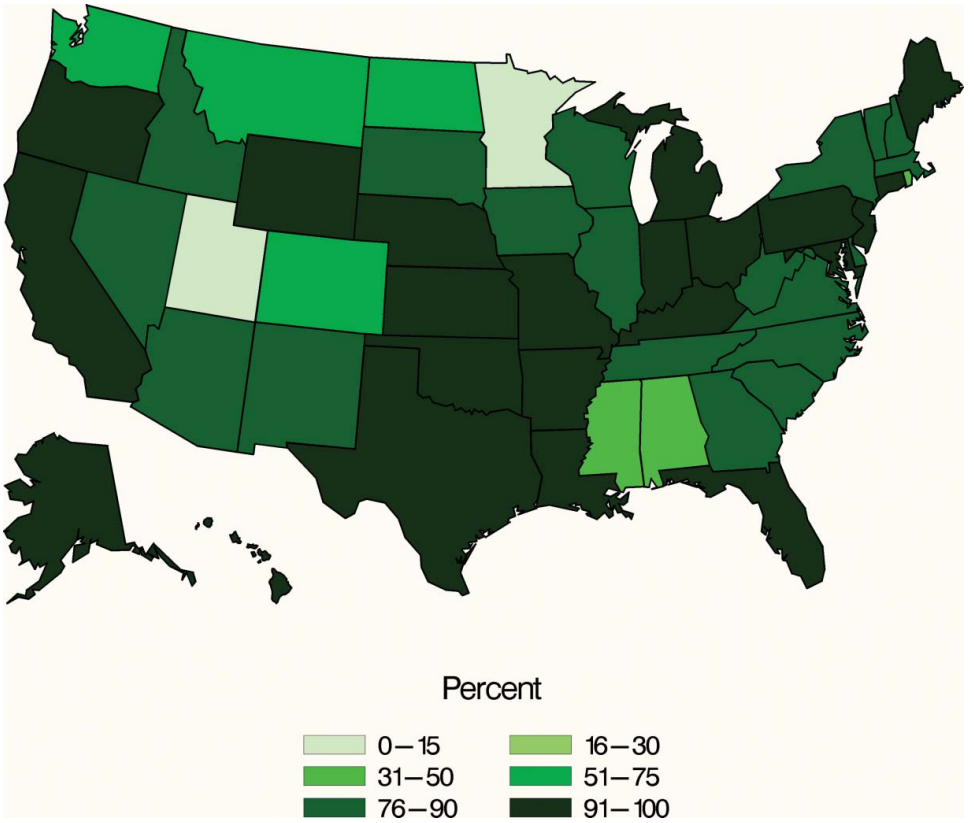

Figure 2 *Percentage of places with numbered streets that have Philadelphia-style street numbering in the United States. Source: Cartography by David Atkinson. (Color figure available online.)*

streets in both directions numbered by intervals of 100 combined with directional identifiers (e.g., West 100 South) centered on the Temple Square—which then served as a model for other cities and towns across the state.

Although the Philadelphia plan is predominant at the national level, it was not uniformly adopted throughout the country (Figure 2). For instance, less than 1 percent of places with numbered streets in Minnesota have adopted Philadelphia-style street numbering, whereas 98.2 percent of Maine's street numbering plans followed Philadelphia's lead. The New York plan only surpasses the Philadelphia plan in two states (Utah and Minnesota), and in most other states the proportion of places with numbered streets in more than one direction is far below 50 percent (Figure 3). The patterns of street lettering also vary significantly from state to state, from a low of 0.9 percent in Maine up to a high of 52.6 percent in Nevada, with most other states below 30 percent overall (Figure 4).

When individual states are grouped together into geographical regions, a number of spatial patterns become evident (Table 1).[7] First, the prevalence of numbered streets is lowest in New England (19.3 percent) and highest in the West (72 percent), with the remaining regions somewhere in between (40–60 percent). Few places in New England include street numbers throughout a significant portion of a town (15.9 percent) in contrast to the Southwest (72.2 percent) and West (74.1 percent), where most street numbering systems encompass the majority of the downtown core. The lettering of streets is also considerably more common in the Southwest (22.3 percent) and West (23.1 percent) in comparison to other regions, which are all below 10 percent.

At the regional level, the Philadelphia plan is most common in the Mid-Atlantic region (91 percent) and least commonly found in the West (67.3 percent). Conversely, New York–style street numbering is most prevalent in the West (29.5 percent) and least prevalent in the Mid-Atlantic region (9 percent). These spatial patterns are likely due to the fact that the New York plan was not fully implemented until well into the nineteenth century (Scobey 2002), long after many of the cities and towns on the East Coast had been laid out, yet contemporaneous with the establishment of new towns in the West.

Population Size and the Prevalence of Street Numbering

The data also indicate that larger cities are more likely than smaller towns to have numbered and lettered

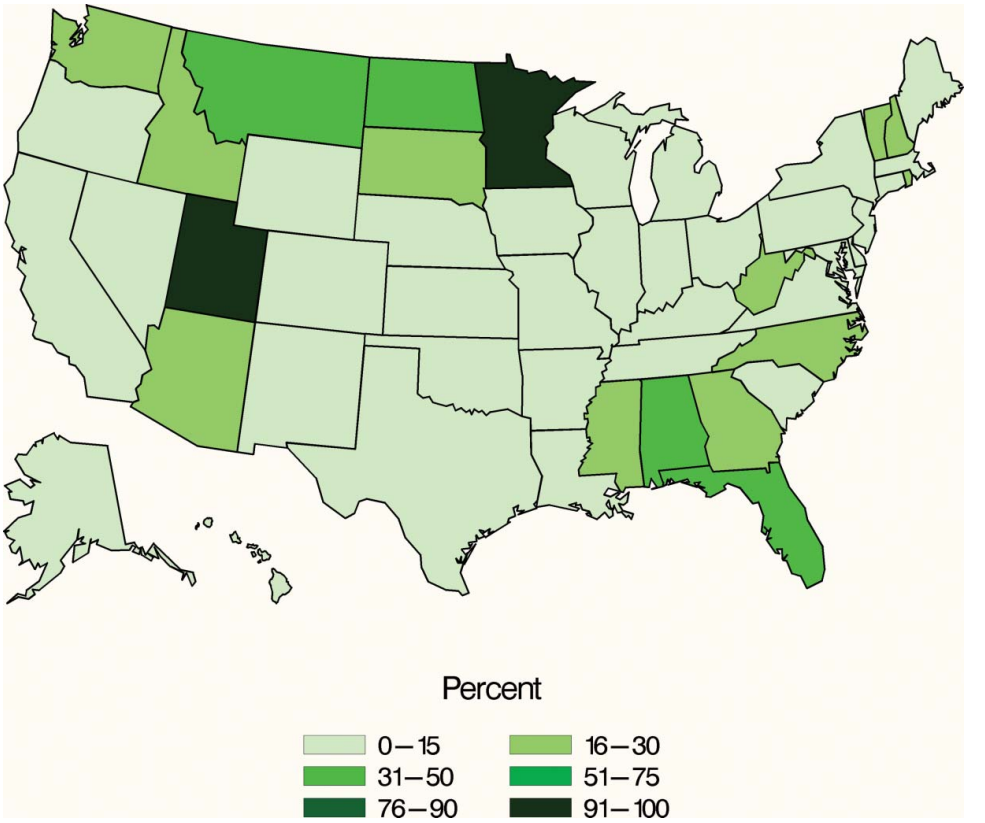

Figure 3 *Percentage of places with numbered streets that have New York-style street numbering in the United States. Source: Cartography by David Atkinson. (Color figure available online.)*

streets (Figure 5). This is not particularly surprising because large cities have more streets than small towns, so there is a greater chance that at least a small pocket of a large city has street numbers in comparison to a smaller community. All U.S. cities with a population of half a million or higher have numbered streets, and the majority of these cities (61.3 percent) have lettered streets as well. Yet it is noteworthy that 43.1 percent of very small towns (population < 1,000) also have street numbering systems, so the size of a locality is not the only factor that has influenced the adoption of street numbering as a regime of spatial inscription.

Because the prevalence of street numbering is positively associated with population size, and there are also far more small towns than large cities, it follows that the inclusion of small towns in our calculations has driven down the overall estimate of how widespread street numbering is in the United States. When all towns with fewer than 1,000 people are excluded from our previous analysis, the proportion of places with numbered streets across the country climbs from 49.6 percent to 55.1 percent (and from 9.8 percent to 12.8 percent for lettered streets). Similarly, if we are only concerned with cities that have a population of 10,000 or higher, then the prevalence of cities with street numbers nationally jumps to 67.1 percent (23.1 percent for lettered streets). The national estimate is even higher for those cities with a population of 100,000 and above (84 percent have numbered streets and 42.2 percent contain lettered streets). Numbered streets are therefore present in the vast majority of large cities across the United States.

Constructing a Historical Timeline of Street Numbering Using Date of Incorporation as a Proxy Variable

The most challenging aspect of this study was attempting to add a temporal component to the analysis, as it was impractical to determine the precise date that street numbering was introduced in every city and town throughout the country. Instead, we used the legal date of incorporation of a place as a proxy variable to construct a historical timeline of street numbering practices. In total, we were able to compile the incorporation dates for 15,875 localities, or approximately 69 percent of all incorporated places.[8] Based on these data, we constructed a timeline including the total number of places that were incorporated per year as well as the number of these places that currently have numbered streets (Figure 6). As this timeline illustrates, there was a peak in the overall number of places that incorporated at the turn of the twentieth

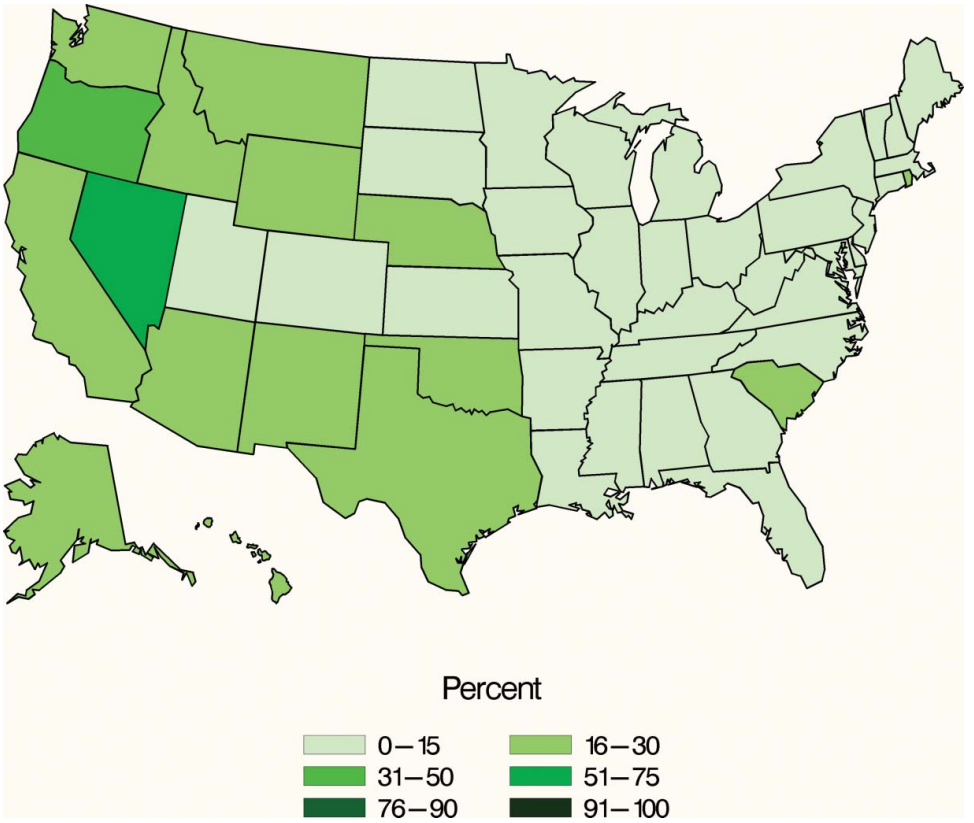

Figure 4 *Percentage of places with lettered streets in the United States. Source: Cartography by David Atkinson. (Color figure available online.)*

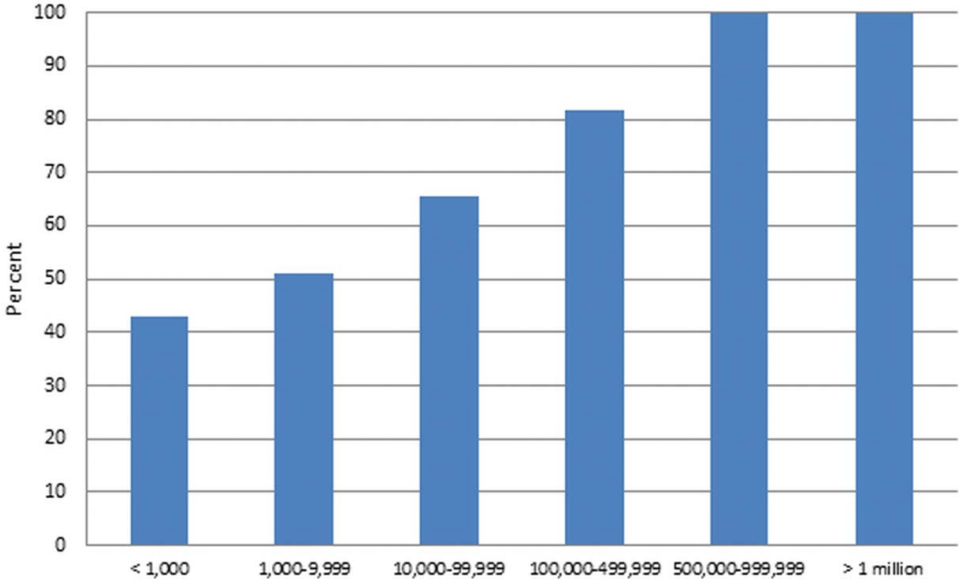

Figure 5 *Percentage of places with numbered streets in the United States by population size. (Color figure available online.)*

Table 1 *Geographies of street numbering in the United States*

State	Total no. of places	Places with numbered streets (%)	Places with numbered streets that have the Philadelphia plan (%)	Places with numbered streets that have the New York plan (%)	Places with numbered streets that have numbers in a significant area (%)	Places with numbered streets that have cardinal directions (%)	Places with numbered streets that have directional quadrants (%)	Places with lettered streets (%)
United States	22,930	49.6	79.1	21.0	61.0	48.8	9.9	9.8
New England	1,628	19.3	72.3	11.8	15.9	12.7	1.0	7.1
Connecticut	175	48.6	90.6	9.4	28.2	34.1	3.5	10.3
Maine	532	10.5	98.2	1.8	14.3	7.1	0.0	0.9
Massachusetts	353	28.1	86.9	13.1	17.2	5.1	0.0	13.3
New Hampshire	264	13.6	83.3	16.7	2.8	0.0	0.0	10.2
Rhode Island	39	56.4	41.0	27.3	0.0	0.0	0.0	25.6
Vermont	265	6.0	81.3	18.8	0.0	12.5	0.0	3.4
Mid-Atlantic	3,426	40.1	91.0	9.0	38.4	28.9	0.7	6.1
District of Columbia	1	100.0	100.0	0.0	100.0	0.0	100.0	100.0
Delaware	57	43.9	88.0	12.0	36.0	40.0	4.0	12.3
Maryland	157	49.0	89.6	10.4	45.5	18.2	2.6	10.8
New Jersey	545	53.6	91.4	8.6	24.0	27.4	0.3	7.5
New York	615	34.0	86.6	13.4	36.4	16.3	0.5	6.5
Pennsylvania	2,051	37.5	92.3	7.7	43.6	33.6	0.5	5.0
South	4,555	43.4	82.2	20.6	47.4	41.2	7.8	8.3
Alabama	456	39.5	51.1	48.9	55.0	39.4	15.0	9.7
Arkansas	501	49.1	91.1	8.5	24.0	67.5	5.7	7.4
Florida	408	44.9	88.5	42.6	83.6	45.4	33.9	10.5
Georgia	541	33.2	75.1	24.9	48.3	32.2	7.3	4.6
Kentucky	422	39.3	97.0	3.0	66.3	48.8	1.2	2.8
Louisiana	302	55.0	91.6	8.4	60.8	39.8	1.2	6.6
Mississippi	296	50.3	38.5	23.5	51.7	36.2	1.3	10.5
North Carolina	548	40.7	79.4	20.6	43.1	38.1	5.8	10.2
South Carolina	268	40.3	85.2	14.8	28.7	25.0	3.7	28.7
Tennessee	349	32.4	87.6	12.4	43.4	53.1	4.4	6.3
Virginia	230	49.1	87.6	12.4	37.2	28.3	8.0	13.0
West Virginia	234	65.0	78.3	21.7	25.0	21.1	0.7	11.5
Midwest	9,221	54.1	75.3	24.8	68.8	55.1	8.9	6.7
Illinois	1,294	49.4	87.9	12.2	64.0	68.7	2.7	3.6
Indiana	568	54.4	92.2	7.8	72.8	74.1	3.9	7.2
Iowa	947	66.1	80.2	13.1	92.5	48.7	11.0	7.1
Kansas	627	69.2	96.1	3.9	90.3	64.5	2.3	13.7
Michigan	533	51.2	89.0	11.0	57.5	36.6	4.0	8.1
Minnesota	853	72.3	0.8	99.2	28.9	51.4	28.9	3.6
Missouri	950	48.6	93.9	6.1	76.6	53.5	3.7	5.4
Nebraska	531	65.4	91.9	8.1	53.1	50.1	0.9	19.4
North Dakota	357	89.4	56.1	43.9	94.4	55.8	26.7	7.6
Ohio	938	38.7	88.7	11.3	41.3	44.9	4.4	3.3
South Dakota	308	81.8	75.8	24.2	82.9	56.3	8.7	7.8
Wisconsin	1,315	26.6	84.9	15.1	52.6	49.7	1.1	5.2
Southwest	1,989	59.8	88.6	11.4	72.2	61.3	11.3	22.3
Arizona	90	77.8	77.1	22.9	61.4	80.0	0.0	20.0
New Mexico	101	69.3	87.1	12.9	71.4	54.3	5.7	24.8
Oklahoma	594	70.9	88.6	11.4	84.1	54.6	20.4	20.7
Texas	1,204	52.2	90.0	10.0	65.5	64.6	7.2	23.0
West	2,111	72.0	67.3	29.5	74.1	53.5	25.0	23.1
Alaska	149	38.3	93.0	7.0	52.6	12.3	0.0	20.1
California	478	56.3	91.5	8.6	56.9	45.4	1.1	28.0
Colorado	271	70.1	59.5	15.3	73.2	65.8	4.7	13.3
Hawaii	5	40.0	100.0	0.0	50.0	0.0	0.0	20.0
Idaho	200	71.5	78.3	21.7	81.1	75.5	0.7	17.0
Montana	129	89.9	57.8	42.2	75.0	66.4	10.1	24.0
Nevada	19	84.2	87.5	12.5	81.3	62.5	0.0	52.6
Oregon	240	79.2	92.1	7.9	78.4	45.3	31.1	32.1
Utah	240	92.1	4.5	95.5	95.0	40.5	91.4	8.8
Washington	281	86.5	69.1	30.9	70.4	57.2	37.0	31.3
Wyoming	99	71.7	88.7	11.3	77.5	67.6	2.8	25.3

century, so it is to be expected that the absolute number of places with street numbers would also be highest at this time.

To provide a more fine-grained historical analysis, we calculated the proportion of places with numbered streets that were incorporated in fifty-year intervals from the colonial period to the beginning of the twenty-first century (Figure 7). Among those places that were incorporated prior to 1700, approximately half of them currently have numbered streets (49.7

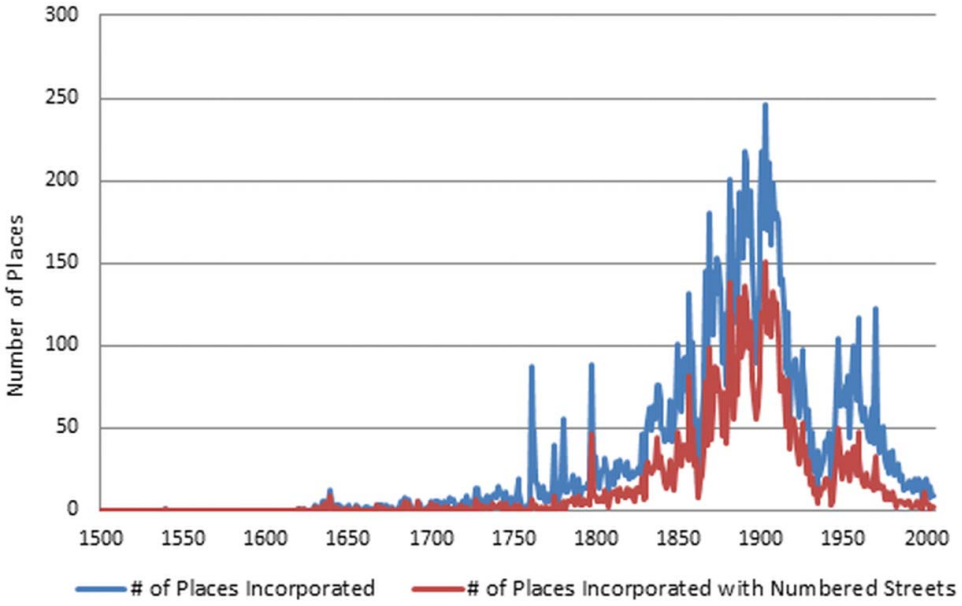

Figure 6 *Historical timeline of street numbering in the United States by date of incorporation. (Color figure available online.)*

percent). Caution must be exercised, however, when interpreting these results, because the overall number of places incorporated during the early colonial period was very low in comparative terms (less than 100), which could skew the calculation. Moreover, it is likely that many of the street numbers that are currently found in these cities were the result of subsequent developments as each city grew over the course of the nineteenth and twentieth centuries.

The data also show that less than 25 percent of places that were incorporated during the eighteenth century currently have numbered streets (24.5 percent from 1700–1799). During the first half of the nineteenth century, the proportion of places with numbered streets jumped dramatically to 42.5 percent, and street numbering systems can be found in 56.7 percent of those places incorporated between 1850 and 1899. The percentage of places with numbered streets then peaked between 1900 and 1949 (57.3 percent), yet dropped sharply during the second half of the twentieth century (33.2 percent from 1950–1999) and shows no signs of another

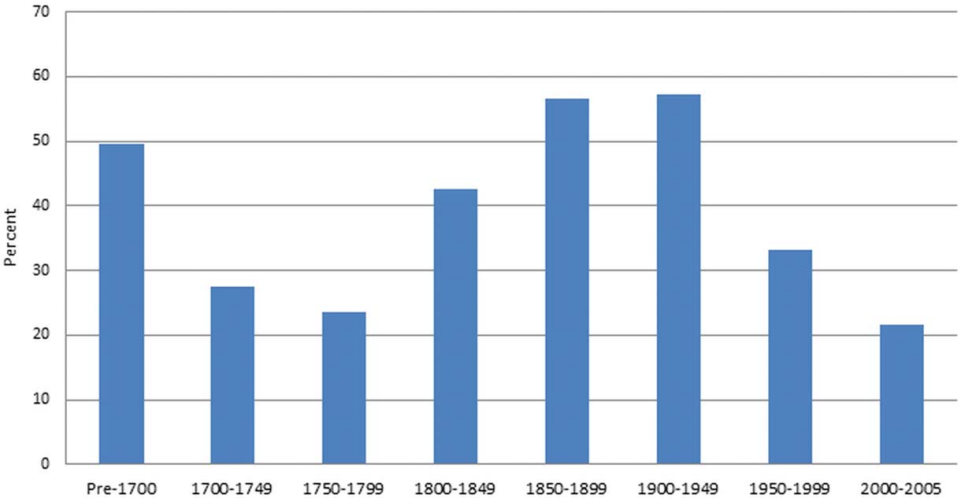

Figure 7 *Percentage of places with numbered streets in the United States by date of incorporation (fifty-year intervals). (Color figure available online.)*

upswing into the twenty-first century (21.6 percent from 2000–2005). This general decline was observed across all regions, for both numbered and lettered streets—starting even earlier in New England, where the number of new incorporations decreased significantly after the turn of the twentieth century.

Overall, then, the data indicate that the practice of street numbering did not have a significant influence on urbanism in the United States until the nineteenth century. This historical trend can be explained, in part, by the fact that most places that were incorporated prior to the nineteenth century were along the Eastern seaboard and were less influenced by the rectilinear township and range survey system that was used to subdivide land further to the West. By contrast, most of the places in the Western regions of the country were incorporated between 1850 and 1950, which was precisely the same time that street numbering came into vogue as a technique of urban spatial organization. This also corresponds to the period during which modernist approaches to urban planning were most influential. With the advent of mass-suburbanization following World War II, however, street numbering fell out of fashion as the modernist aesthetic of the grid gave way to curvilinear suburban drives and residential cul-de-sacs.

Conclusion

This study has documented the spatiotemporal patterns of alphanumerical street designation across the United States to assess the extent to which the logic of number has been inscribed into the spaces of everyday urban life. As we have shown, the vast majority of large urban centers in the United States emulated some variant of the street numbering systems developed in Philadelphia, New York, and Washington, DC. For the most part, the Philadelphia model predominated because "as a much used point of departure for westward migrations to the interior, Philadelphia lent its plan as well as its capital to aid in the establishment of new towns beyond the Appalachians" (Reps 1965, 294). Furthermore, the Philadelphia plan preceded those of New York and Washington by over a century, so it was a well-known urban model even before the latter two plans "got on paper" (Stewart [1945] 1967, 247).

The increase in the proportion of places with numbered streets from East to West is also partly attributable to the national survey grid that provided a template for settlement west of the Ohio River. The township survey grid is commonly portrayed as an exemplar of Enlightenment rationalism, and the urban street grids so prevalent in the West are often viewed as evidence of the utilitarian ethos that has shaped urban development in North America. Likewise, the numbering of streets can also be seen as yet another example of efforts to establish a "new urban world of order, regularity, and simplicity" (Reps 1965, 294). Yet actually existing spaces of number can just as easily signify an imbroglio of spatial contradictions as they can represent the alleged radiance of Cartesian intelligibility.

Whether the numbered street grids in U.S. cities and towns were consciously designed and laid out to be calculable spaces, however, is beside the point. What is more significant is that the very attempt to order a city or territory by means of number presupposes a calculative conception of space (Elden 2010). More often than not, such calculative rationalities and practices were simply part of the stock-in-trade of modern surveying, engineering, and planning. To the extent that a discourse on street numbering emerged during the nineteenth and twentieth centuries, it was largely centered around the question of devising, as one city engineer put it, "a trail that any one can follow, and find any address without map or street guide, provided he knows his alphabet and can count" ("A Solution to the Street Maze Problem" 1939, 18). Along with house numbering and the gridding of urban space, it could certainly be argued that the numbering of streets was a strategy employed to systematize a city's streetscape to facilitate the circulation of capital, extend the administrative reach of the state, and enhance urban wayfinding.

Compelling though these explanations might be for large cities, they nevertheless fall short in explaining why a large proportion of small towns in the United States also have numbered streets. In places with less than a dozen streets, the so-called "street maze problem" was likely less important than creating the appearance that a town's layout was designed according to "modern" standards. In this respect, the replication of the Philadelphia and New York plans was not solely a means of producing a landscape of spatial legibility for utilitarian ends alone; it also served as a hallmark of modernity more generally and, by the mid-nineteenth century, street numbering had become part of the standard toolkit of modern planning practices.

Given the lack of scholarship on the geographies of street numbering in the United States, this study has sought to provide a general overview of the role that such mathematical techniques have played in the production of the "ordered city" (Rama 1996, 1). To do so, we have admittedly adopted a rather conventional approach to analyzing the spatial variation of street numbering patterns across the United States. Yet these rudimentary methods have allowed us to provide the first comprehensive, nationwide account of what is arguably one of the most significant planning practices used in the spatial organization of cities and towns across North America and beyond. This sort of macrolevel analysis has its limits, of course, and one potential avenue for future research would be to conduct more in-depth case studies of the use of street numbering, and related calculative techniques, within

particular historical–geographical contexts as part of a critical spatial history of the geocoded world.

Finally, although this study has highlighted the importance of street numbering as a spatial practice, the distinction between street naming and numbering should not be overdrawn. As Vuolteenaho (2012) rightly argued, "Both practices play the same role of unambiguous spatial identification as part of wider addressing systems and efforts to keep track of urban spaces, processes and people" (660). Yet what distinguishes the numbering of streets from other naming conventions is that it provides a means to construct a coordinated "system" of spatial identification. It was through such mundane efforts to construct spaces of enumeration that the geographies of mathematization were produced over the past three centuries. Therefore, when the late-nineteenth-century critic William Ward Crane ridiculed Americans for their "habit of depending for street titles on mere alphabetic and numerical signs," he was calling attention to one of the primary techniques through which the U.S. landscape was being transformed into a geocoded space of numerical calculation.

Acknowledgments

We would like to thank all of the research assistants and volunteers who helped collect data for this project, including Amanda Manning, Matt Brumley, Samuel Mullins, Benjamin Janik, and Nicholas Samuel at Texas A&M University, as well as Kerensa Mattison, Elliot Turnbull, Brittany Schina, Kayla Cheeke, Logan Richards, Alexandra Evers, and CindyAnn Rose-Redwood at the University of Victoria. The results presented in this article would not have been possible without their meticulous efforts. We would also like to acknowledge David Atkinson for his cartographic assistance, the three anonymous reviewers for their constructive criticism, and the journal's editor, Barney Warf, for his patience throughout the revision process. An earlier version of this article was presented at the Digital Geohumanities Symposium at the University of Victoria in April 2013 and at the 2014 annual meeting of the Association of American Geographers in Los Angeles. We appreciate all of the feedback received at these events and are especially grateful to Jani Vuolteenaho for his encouragement over the years to complete this study of the geographies of street numbering in the United States.■

Notes

[1] Indeed, the Japanese city of Heian-kyō (now Kyoto) was laid out as a grid plan with numbered streets as early as the eighth century CE, based on the model of the Chinese imperial city, Chang'an (Shively and McCullough 2008). By contrast, street numbering did not likely appear in Europe until the thirteenth century CE (Vuolteenaho 2012). With respect to the presence of street numbering on every continent around the world, this claim was verified by conducting selective search queries using Google Maps.

[2] Currently, Boston has various numbered streets scattered throughout the city, yet these street numbers are later additions that were not part of Boston's colonial street layout.

[3] Yet, as Stewart ([1945] 1967) himself acknowledged, "[n]umbers and letters sometimes attain symbolic value, but less easily and often" (248). For a more recent discussion of the symbolic capital associated with numerical street naming, see Rose-Redwood (2008b).

[4] For a compelling justification for the strategic use of quantitative methods to serve the ends of critical geography, see the two-part focus section on "Critical Quantitative Geographies" in *The Professional Geographer* (Kwan and Schwanen 2009; Schwanen and Kwan 2009).

[5] The research team consisted of the current authors as well as several research assistants and volunteers. Because we began collecting data in 2007, our analyses are based on the list of incorporated places as recorded in the 2000 census (updated to 2006). The census data included numerous duplicate entries, and other miscellaneous information, which were deleted during the data collection process. As a result, there might be minor data entry errors that have slightly altered the estimate of how many incorporated places there are in the United States.

[6] Because Stewart's estimates were made in 1945, we recalculated the proportion of places with numbered streets at that time, which comes to a total of 52.3 percent (9.9 percent for places with lettered streets). Therefore, he was indeed correct to maintain that, in 1945, more than half of all places in the United States had numbered streets.

[7] For the purposes of this study, we have followed the U.S. State Department's (2008) classification of geographical "regions" for the sake of convenience. Of course, this should not imply that these regional designations have an ontological status that can be separated from the act of classification itself.

[8] Using state almanacs, blue books, and related sources, we were able to compile incorporation dates for the vast majority of places in thirty-six of fifty states across the United States. Although not comprehensive, our sample includes a selection of states from all regions of the country.

Literature Cited

Adebanwi, W. 2012. Glocal naming and shaming: Toponymic (inter)national relations on Lagos and New York's streets. *African Affairs* 111 (445): 640–61.

Akkerman, A. 2001. Urban planning in the founding of Cartesian thought. *Philosophy & Geography* 4 (2): 141–67.

Alderman, D. 2000. A street fit for a king: Naming places and commemoration in the American South. *The Professional Geographer* 52 (4): 672–84.

Alderman, D., and J. Inwood. 2013. Street naming and the politics of belonging: Spatial injustices in the toponymic commemoration of Martin Luther King, Jr. *Social & Cultural Geography* 14 (2): 211–33.

Augustins, G. 2004. Naming, dedicating: Street names and tradition. *History and Anthropology* 15 (3): 289–99.

Azaryahu, M. 1996. The power of commemorative street names. *Environment and Planning D: Society and Space* 14 (3): 311–30.

Baldwin, L., and M. Grimaud. 1989. Washington, Montana, the Dakotas—and Massachusetts: A comparative approach to street naming. *Names* 37 (2): 115–38.

Berg, L., and J. Vuolteenaho, eds. 2009. *Critical toponymies: The contested politics of place naming*. Aldershot, UK: Ashgate.

Bigon, L. 2009. Urban planning, colonial doctrines and street naming in French Dakar and British Lagos, c. 1850–1930. *Urban History* 36 (3): 426–48.

Cicchini, M. 2012. A new "inquisition"? Police reform, urban transparency and house numbering in eighteenth-century Geneva. *Urban History* 39 (4): 614–23.

Corwin, M. 1978. Street-naming and property-numbering systems: Report No. 332, Planning Advisory Service, American Society of Planning Officials, Chicago.

Crampton, J. 2011. Cartographic calculations of territory. *Progress in Human Geography* 35 (1): 92–103.

Crampton, J., and S. Elden. 2006. Space, politics, calculation: An introduction. *Social & Cultural Geography* 7 (5): 681–85.

Crane, W. 1897. Our street names. *Lippincott's Monthly Magazine* 60:264–66.

Elden, S. 2005. Missing the point: Globalization, deterritorialization and the space of the world. *Transactions of the Institute of British Geographers* 30 (1): 8–19.

———. 2006. *Speaking against number: Heidegger, language and the politics of calculation*. Edinburgh, UK: Edinburgh University Press.

———. 2010. Land, terrain, territory. *Progress in Human Geography* 34 (6): 799–817.

Hamlin, F. 1999. Numbers in placenames. *Names* 47 (3): 233–42.

Hannah, M. 2009. Calculable territory and the West German census boycott movements of the 1980s. *Political Geography* 28 (1): 66–75.

Harris, R., and R. Lewis. 2012. Numbers didn't count: The streets of colonial Bombay and Calcutta. *Urban History* 39 (4): 639–58.

Huxley, M. 2008. Space and government: Governmentality and geography. *Geography Compass* 2 (5): 1635–58.

Kwan, M., and T. Schwanen. 2009. Quantitative revolution 2: The critical (re)turn. *The Professional Geographer* 61 (3): 283–91.

Light, D. 2004. Street names in Burcharest, 1990–1997: Exploring the modern historical geographies of post-socialist change. *Journal of Historical Geography* 30 (1): 154–72.

Linklater, A. 2002. *Measuring America: How the United States was shaped by the greatest land sale in history*. London: HarperCollins.

Mencken, H. L. 1948. American street names. *American Speech* 23 (2): 81–88.

Mitchell, R. 1990. The North American past: Retrospect and prospect. In *North America: The historical geography of a changing continent*, ed. R. Mitchell and P. Groves, 3–21. Savage, MD: Rowman & Littlefield.

Norman, E. 2013. Who's counting? Spatial politics, ecocolonisation and the politics of calculation in Boundary Bay. *Area* 45 (2): 179–87.

Palonen, K. 1993. Reading street names politically. In *Reading the political: Exploring the margins of politics*, ed. K. Palonen and T. Parvikko, 103–21. Tampere: Finnish Political Science Association.

Rama, Á. 1996. *The lettered city*. Durham, NC: Duke University Press.

Reps, J. 1965. *The making of urban America: A history of city planning in the United States*. Princeton, NJ: Princeton University Press.

Rose-Redwood, R. 2008a. Indexing the great ledger of the community: Urban house numbering, city directories, and the production of spatial legibility. *Journal of Historical Geography* 34 (2): 286–310.

———. 2008b. "Sixth Avenue is now a memory": Regimes of spatial inscription and the performative limits of the official city-text. *Political Geography* 27 (8): 875–94.

———. 2011. Mythologies of the grid in the Empire City, 1811–2011. *Geographical Review* 101 (3): 396–413.

———. 2012a. "A regular state of beautiful confusion": Governing by numbers and the contradictions of calculable space in New York City. *Urban History* 39 (4): 624–38.

———. 2012b. With numbers in place: Security, territory, and the production of calculable space. *Annals of the Association of American Geographers* 102 (2): 295–319.

Rose-Redwood, R., and A. Tantner. 2012. Introduction: Governmentality, house numbering and the spatial history of the modern city. *Urban History* 39 (4): 607–13.

Schwanen, T., and M. Kwan. 2009. "Doing" critical geographies with numbers. *The Professional Geographer* 61 (4): 459–64.

Scobey, D. 2002. *Empire city: The making and meaning of the New York City landscape*. Philadelphia: Temple University Press.

Scott, J. 1998. *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven, CT: Yale University Press.

Shively, D., and W. McCullough, eds. 2008. *The Cambridge history of Japan: Vol. 2. Heian Japan*. Cambridge, UK: Cambridge University Press.

A solution to the street maze problem. 1939. *Public Works* March:18.

Stewart, G. [1945] 1967. *Names on the land: A historical account of place-naming in the United States*. Boston: Houghton Mifflin.

Tantner, A. 2009. Addressing the houses: The introduction of house numbering in Europe. *Histoire & Mesure* 24 (2): 7–30.

U.S. Census Bureau. 1993. *Census and you*. Washington, DC: U.S. Department of Commerce, Geography Division.

———. 2007. *Population estimates—All incorporated places: 2000 to 2006*. Washington, DC: U.S. Department of Commerce. http://www.census.gov/popest/data/cities/totals/2006/SUB-EST2006-4.html (last accessed 28 June 2013).

U.S. State Department. 2008. *The regions of the United States*. Berlin: U.S. Diplomatic Mission to Germany. http://usa.usembassy.de/travel-regions.htm (last accessed 28 June 2013).

Vuolteenaho, J. 2012. Numbering the streetscape: Mapping the spatial history of numerical street names in Europe. *Urban History* 39 (4): 659–79.

Yeoh, B. 1996. Street-naming and nation-building: Toponymic inscriptions of nationhood in Singapore. *Area* 28 (3): 298–307.

Ziyu, L., C. Millward, and Z. Bin. 1983. Notes on place-naming in Chinese and English. *Names* 31 (1): 29–40.

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