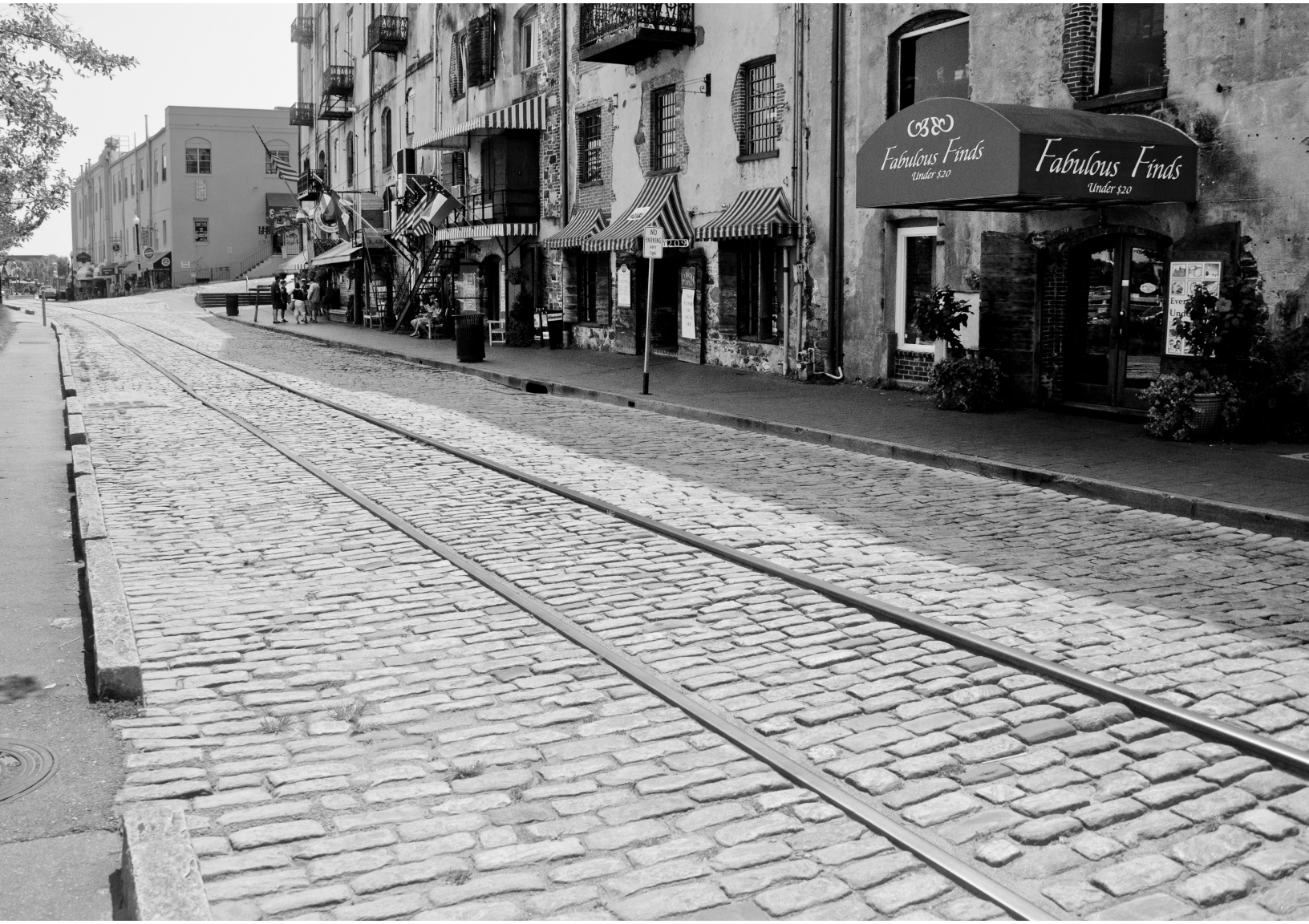


Abstract

By the end of the nineteenth century, street pavement was synonymous with modernity. Municipal authorities around North America struggled to improve not only the health and appearance of their cities, but also the movement of vehicles. Although sheet asphalt, which would come to dominate street pavement in the twentieth century, was employed beginning in the 1870s, it did not provide the modernizing cure-all as readily as historians have suggested. In reality, local conditions, regional practices, and economic concerns played significant roles in prompting municipalities to experiment with a wide range of paving materials. Savannah, Georgia, was typical and offers a rich case study both for the wealth of municipal documentation that survives and the persistence of numerous historic paving materials that attest to the highly experimental nature of this civic improvement.

"A Well-Paved City": Variety, Locality, and Modernity in Paving Savannah's Streets

ROBIN B. WILLIAMS

> Paved streets are inseparable from municipal progress. Good roads are demanded by all citizens interested in the city's development, as well as its appearance. . . . Little has been done, comparatively, until recent years, and much remains to be accomplished before Savannah can be referred to as a well-paved city. (Herman Myers, Mayor of Savannah, 1896)[1]

> For years to come street paving must occupy the attention of the municipal government. A progressive city must have its streets paved. The time has passed in the history of Savannah, or of any other city which is ambitious of continued development, when it could rest content with a few paved thoroughfares and a wilderness of sandy roadbeds. (Herman Myers, Mayor of Savannah, 1905)[2]

Herman Myers (1847-1909), five-time mayor of Savannah (1895-1897 and 1899-1905), was certainly not alone in seeking to modernize his city by paving streets. Across North America, communities struggled with the challenge of improving the quality of urban life. Mid-nineteenth-century Savannah newspapers contain numerous accounts of the "nuisance" created by the formation of "lakes and lagoons" on the city's streets after each rainstorm, which were "conducive of disease" (Fig. 1).[3] The situation could be so bad that one newspaper account suggested for citizens who could "not mount themselves on horseback or walk on stilts, that pontoons be thrown across divers [sic] places on numerous streets. . . . The ladies, who have no carriages, are calling for pontoons too loudly to be unheeded."[4] Unpaved streets, the presence of animal waste (especially horse manure), and limited drainage for rainwater posed serious health problems for urban residents. Poor drainage led to

Figure 1
Stereoscopic view of Bull Street looking north toward Wright Square, Savannah, c.1860 (G90F156_012F. Courtesy Robert N. Dennis Collection of Stereoscopic Views, Miriam and Ira D. Wallach Division of Art, Prints, and Photographs, The New York Public Library, Astor, Lenox, and Tilden Foundations).

stagnant ponds following rains, which provided an ideal breeding ground for mosquitoes that carried malaria and, most feared, yellow fever.[5] Ironically, overly dry weather posed the problem of excessive dust, necessitating sprinkling streets with water.[6] The increase in vehicular traffic during the last quarter of the nineteenth century put additional pressure on cities to pave their streets. Even before the emergence of the automobile, bicyclists promoted the Better Roads Movement and actively lobbied politicians and municipal officials around the country to improve the quality of pavement.[7] Sanborn Fire Insurance maps identified streets as "paved" or "not paved," implying that pavement, like fire hydrants and buildings made of brick, contributed to fighting urban fires. Another factor motivating cities to pave streets, according to Clay McShane, was "the great nineteenth-century shift in housing tastes from densely packed row housing to detached suburban homes," which was accompanied by changes in the perception and uses of streets from social spaces to, by 1900, arteries for transportation.[8]

Although a few American cities had streets paved with stone block, cobblestones, or gravel during the colonial era, Savannah had not been one of them. Its smaller size – the city never ranked higher than twenty-first in population size among the nation's cities, as it did in 1800 – and disproportionately wide streets must have presented a significant financial challenge to the municipal government. Indeed, as the city embarked in earnest in the 1850s on a campaign to pave its streets, financial considerations ranging from the basic cost of the material, shipping costs to acquire the material, and maintenance costs after installation, played important roles in the selection of paving materials and the amount of surface to be paved. Health considerations, cleanliness, and the efficiency of movement of both horse-drawn carts and pedestrians made paving streets a priority. By the late nineteenth century, being a well-paved city was synonymous with modernity.

The question of how and when public works departments and municipal engineers across the country addressed the challenge of paving city streets and what role the availability of asphalt, or more

properly sheet asphalt, played has received limited scholarly attention. Among architectural historians, Spiro Kostof, in his book *The City Assembled*, offered a rare though brief discussion of street pavement. He noted that "The great turning point in street paving came with the perfection of asphalt," which "from about 1885 on …became the all-purpose, modern street cover in both Europe and the United States."[9] His account inaccurately suggests that asphalt became the *de facto* pavement of choice after 1885, when in fact it would not be until the 1920s that its hegemony began to be felt. A relatively small number of historians have focused considerable attention on the history of urban infrastructure, including street pavement. Clay McShane has analyzed the social forces guiding municipal paving decisions, as well as the impact of asphalt in the years after 1900 and notes that "by 1924 municipalities had paved almost all urban streets."[10] His path-breaking analysis looks at national patterns but creates the false impression that all municipalities embraced asphalt with equal enthusiasm, attracted by its vaunted smoothness and ease of maintenance. The analyses of pavement appear to succumb to a deterministic assumption that asphalt alone represented modernity, especially before 1920. The evolution of street paving in the city of Savannah reveals a quite different picture of trial and error. With a surprising variety of materials and local topographical and climate conditions, availability of materials, and economics playing fundamental roles in guiding decisions about pavement, the shift to asphalt was not as simple, nor as quick as previous studies have suggested.

USING SAVANNAH AS AN URBAN CASE STUDY

By 1917, Savannah had 51.5 miles of streets paved, with just under 10 percent being sheet asphalt, even though the city had been employing the material since 1886. By comparison, vitrified bricks, used since 1896, constituted 33 percent of all pavement, while asphalt blocks, used since 1906, amounted to 30 percent. Monolithic concrete, employed only since 1915, already constituted over 5 percent.[11] It would be tempting to ascribe the slower adoption of sheet asphalt on a widespread scale in Savannah to its being in the South, where one supposes regional "backwardness" delayed embracing modern technology. In fact, the city had long been at the forefront of urban improvements, such as planting street trees, as well as passing protective city ordinances in the 1790s and the development of one of the earliest large municipal parks in 1850. Indeed, civic officials in Savannah experimented with sheet asphalt as early as 1881, just eleven years after the material's first successful use in the United States in Newark, New Jersey, and five years after its famous use on Pennsylvania Avenue in Washington, DC, which began popularizing the material. Since the 1850s, Savannah's municipal engineers experimented with a bewildering array of materials and would continue to employ alternatives to asphalt into the 1920s, well after asphalt is assumed to have become the unquestioned pavement of choice. The city not only preserves numerous stretches of historic pavement, but it also retains a voluminous documentary record, both published and archival, that details the significant impact local conditions played on decision making. Such records show that Savannah's civic officials of the late nineteenth century were keenly aware and current with new developments elsewhere but consciously opted to employ alternatives to asphalt. These same records also show that asphalt was not always cheaper and easier to maintain, as other historical analyses suggest. Indeed, comparison to cities in other parts of the continent, such as Minneapolis, Omaha, Baltimore, Brooklyn, and Toronto, shows remarkable regional variations, including the use of alternatives to asphalt

at least until 1920.[12] George W. Tillson, a leading municipal engineer, acknowledged the highly localized nature of solving the problem of paving streets in his manual on street pavements published in 1900: "The experience of one city has not seemed to benefit very greatly any other, but it has seemed necessary for each one to work out the problem for itself." Even with increased communication between cities by the late nineteenth century through official reports, technical societies, and technical journals, he continued, "it by no means follows that the decision as to what is the best paving material for one locality will necessarily govern in another, however intelligently it may have been reached."[13]

PEDESTRIANS AND THE BEGINNING OF PAVEMENT IN SAVANNAH

The wealthier colonial American towns and cities began paving their streets by the late 1600s or early 1700s with stone blocks, and less commonly, gravel.[14] Savannah was a latecomer to this form of civic improvement, likely due to its much smaller size; it endured more than a century of unpaved streets following its founding in 1733. The first part of Savannah's built environment to be paved was not its streets but its sidewalks. The responsibility for paving sidewalks lay completely with a building's owner (even though sidewalks were public property), resulting in a patchwork of different materials. Joseph Louis Firmin Cerveau's highly detailed painting, "View of Savannah," of 1837, shows in the foreground the sidewalk along the south side of Bay Street paved in sections of brick or flagstone, aligning with the buildings they front (Fig. 2). The street by contrast is dirt, with the linear ruts caused by carriage wheels readily apparent. Since trees in Savannah were a municipal concern, they grew in the roadway, along its edge below the curb, and not in the sidewalk (Fig. 3).[15] These patterns of sidewalk pavement and tree planting illustrate a very different concept of the relationship between public and private space from what prevails today. Sometimes the dirt from the street accumulated so deeply on the sidewalks that building occupants were not aware that they had a sidewalk, as a newspaper report from

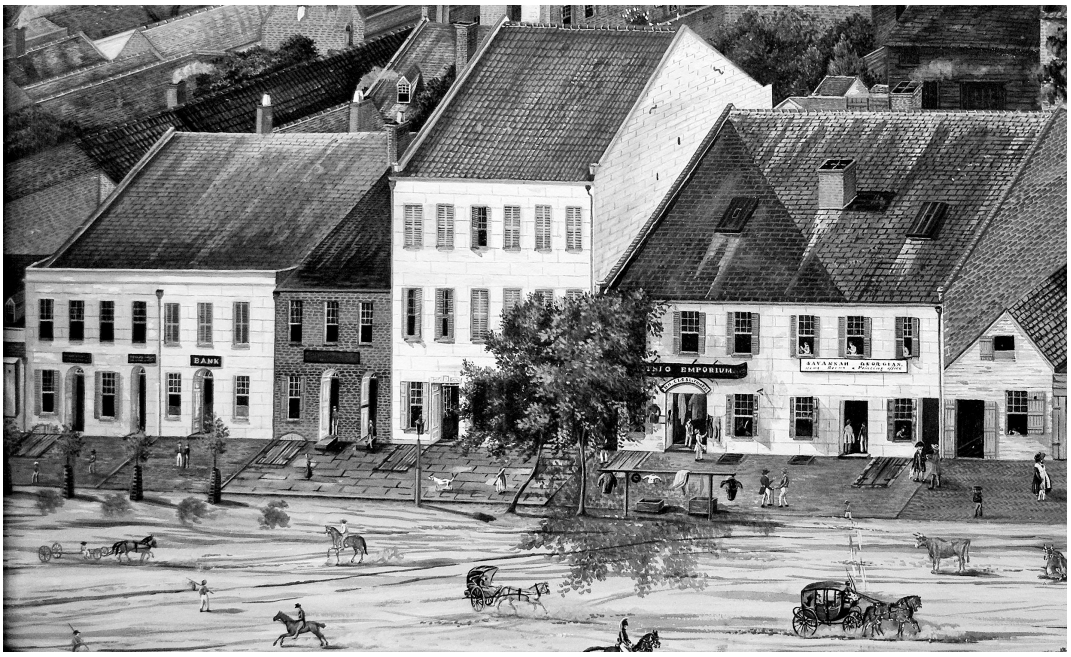


Figure 2
Detail of East Bay Street from "View of Savannah," 1837, Joseph Louis Firmin Cerveau (Courtesy Georgia Historical Society, Savannah, Georgia).

Figure 3
Stereoscopic view of the residence of E. Paddleford, Savannah, c.1860 (Jerome N. Wilson. G90F153_009F. Courtesy Robert N. Dennis Collection of Stereoscopic Views, Miriam and Ira D. Wallach Division of Art, Prints, and Photographs, The New York Public Library, Astor, Lenox, and Tilden Foundations).

1865 in Savannah makes clear: "We have found a sidewalk in front of our counting room. The discovery was made by one of our employees while sweeping."[16]

As a first step in addressing the problem of pedestrians crossing a muddy, unpaved street, municipal engineers in Savannah experimented with earthen "crossings," much like today's speed bumps, extending from curb to curb. These pedestrian viaducts are occasionally visible in photographs of the 1860s and 1870s. Where the mounded earthen paths neared the sidewalk, small "bridges" (typically of wood, but replaced with cast iron in 1870)[17] allowed water to drain into storm catch basins (Figs. 1, 3). At least by the 1850s, the city paved "crossings" with different materials, initially with wood, then with more permanent materials, such as cobblestone, flagstones, and Belgian blocks, in 1879.[18]

EXPERIMENTS WITH MACADAM, WOOD PAVEMENTS, AND STONE

The nineteenth century witnessed a growing desire to experiment with street paving materials. By mid-century, new paving options included macadam, plank roads, and wood blocks, which joined older materials – stone blocks and cobblestones. Macadamized pavement, named after its Scottish inventor John Loudon McAdam, first appeared in London in 1820 and spread to the United States by 1823, when it was used on the Boonsborough Turnpike Road between Hagerstown and Boonsboro, Maryland.[19] Macadam roads greatly simplified paving highways, replacing the typical three layers of progressively smaller stones with two layers of broken stone. Plank roads, literally made from planks of wood (often pine or cypress), first appeared in North America outside Toronto in 1836, leading to over 200 miles constructed in Ontario by 1839; interest in such roads spread to the United States four years later.[20] Mainly popular between 1846 and 1857, over 10,000 miles of plank roads were constructed in the US by over one thousand private companies.[21] Before long, a successor wood pavement, wood blocks, offered a promising alternative.

In Savannah, macadam and plank roads had been employed by the 1850s and wood blocks by about 1869. Each caused significant problems. In reference to plank roads, the 1857 Municipal Report noted that a "substitute for this useful, but very expensive improvement has been commenced at the Eastern end of the city in the form of a macadamised road."[22] Plank roads lasted only four or five years,[23] necessitating frequent and costly repairs. Macadam posed its own problems in Savannah. A local newspaper reported in 1859 that "We have received several communications complaining of the dust from the macadamized pavement on the Bay, which during the past few days, has been almost intolerable."[24] While macadam pavement normally used crushed gravel as its principal material, a local variant incorporating shells

was evidently employed in Savannah when "shingle ballast" (coarse gravel) from ships was not available.[25] By 1870, "the condition of the MacAdamized roadway on Bay Street became so bad as to demand its removal and the substitution of pavements better suited to sustain the great burthen of transportation passing over it, especially in the winter season."[26] The city experimented with two replacement pavements for Bay Street, wood blocks and greywacke stone.

That same year, the city awarded a contract to pave the two central blocks of Bay Street fronting the City Exchange with a wood block pavement called "Stow's Foundation Patent."[27] Henry M. Stow claimed in his promotional pamphlet to have created a "street pavement that would be cheap, substantial, durable, noiseless, and easy for teams and vehicles to travel over; that would not require continual repairs; and would do away with the use of the *vehicle-destroying* and *animal-murdering stone pavement* now in use. My pavement is similar in appearance, but far superior, to the pavement known as the `Nicolson'…" [italics original].[28] The mayor reported that "the contractors claim that the impenetrability of their pavement to air and excessive moisture will ensure the material they use a life of perhaps thirty years."[29] He had good reason to be optimistic about this pavement, recognizing its potential regional merits, allowing "the pine forests of the South … to afford a new contribution of inestimable value to the progress of public improvement."[30]

The Nicolson blocks to which Stow referred were the 1859 invention of Samuel Nicolson, whose successful use of wood-block pavers in 1866 in Boston inspired their use around the country.[31] Just three years after their introduction in Boston, Nicolson blocks were employed on part of Savannah's West Broad Street.[32] That pavement, however, lasted only nine years before its decayed condition necessitated its removal.[33] Despite Stow's claims to superiority over Nicolson's, his blocks fared even worse, being "in decaying condition and in bad order" after only four years.[34] Wood block pavement, however, would prove very popular in Midwestern American cities, such as Nicolson blocks in Chicago, cedar blocks in Minneapolis, and cypress and cedar blocks in Omaha, Nebraska.[35]

The other material used on Bay Street in 1870 to replace the failed macadam involved blocks of Hudson River greywacke,[36] a type of sandstone otherwise called bluestone. As mentioned, the mayor considered affordability important in paving a six-block stretch of Bay Street (Drayton to East Broad Streets).[37] His report noted how the work had been delayed "by the detention of the material at sea,"[38] a comment that underscores the challenges of securing appropriate paving materials. The greywacke proved to be quite durable, remaining in place until at least 1912.[39] In fact, the city used greywacke to replace the failing Nicolson blocks on West Broad Street in 1878.[40] Availability was evidently challenging enough to inspire the city surveyor to note the purchase of 200,000 greywacke stone paving blocks in 1881.[41] Despite apparent success with the material, portions of only three streets in Savannah — Bay Street, West Broad Street, and Wheaton Street on the eastern edge of the city — appear to have ever been paved with greywacke.[42] Other cities made use of other kinds of sandstone as a pavement: for example, in Omaha, Nebraska, a paving map of 1890 documents the use of Woodruff Sandstone and Colorado Sandstone.[43]

In use in older American cities by the time of the American Revolution,[44] naturally rounded and irregular cobblestones proved to be the first successful permanent pavement widely utilized in Savannah, beginning by 1843.[45] The city enthusiastically embraced the material, even though it was viewed poorly by at least one mid-nineteenth-century pavement expert. William Gillespie, a professor of civil engineering at Union College in Schenectady, New York, criticized this type of pavement in his 1847 manual as a "common but very inferior pavement which disgraces the streets of nearly all our cities."[46] The city of Savannah, however, enjoyed a steady supply of the worn, rounded cobblestones from

discarded ballast emptied onto the city's wharfs by incoming ships. Until 1880, the city received between 1,700 and 3,250 tons of this material each year,[47] which cost only a "wharfage" fee (since the wharfs were privately owned). The extensive use of cobblestone pavement appears to have begun on Whitaker Street, one of the principal north-south streets in the center of the city, in 1855,[48] along with on the ramps leading down the bluff from Bay Street to River Street and their masonry retaining walls, where small relief plaques document the work (Fig. 4). During the Civil War, according to the 1866 Municipal Report, the ramps "were entirely destroyed and the material carried away and sunk in the obstructions" in the river.[49] Rebuilding with new cobblestones concluded a year later.[50] All or parts of thirteen streets were paved with cobblestones before the ready supply diminished in the early 1880s following a new requirement for ballast to be unloaded outside the city.[51] A century later, a new threat to the cobbled ramps emerged. With the progressive abandonment of the waterfront warehouses after World War II, the cobblestone ramps served as a quarry for Savannahians who used the stones in their private gardens.[52] According to Eric Meyerhoff, of the firm Gunn and Meyerhoff that designed the Rousakis Plaza along Savannah's waterfront (completed in 1977), so many cobblestones had been removed that, in order to restore all of the ramps, they harvested a considerable amount of historic cobblestone pavement from the Factors' Walk lanes that lie between the ramps behind the warehouses.[53] In their place they installed the present poured concrete pavement that was manually stamped with a cobblestone pattern.

Figure 4
Cobblestone pavement on Lincoln Street Ramp, Savannah, 2011 (Photographs by author unless otherwise noted).

Figure 5
Cobblestone with Chinese characters, Whitaker Street Ramp, Savannah, c.2005 (Photograph by David Anderson).

The international nature of ballast stone is dramatically illustrated by a cobblestone with Chinese characters that had long been present at the foot of Whitaker Street Ramp but that was removed in 2011 (Fig. 5). Investigation by Luciana Spracher, Director of the City of Savannah Research Library and Municipal Archives, has identified the stone as part of a "grave marker for a man named Zhang Lin'an, who died in 1798."[54] The stone testifies to the global nature of trade in the mid-nineteenth century, by which time the United States had joined Britain in active trade with China.

THE ECONOMICS OF PAVEMENT

The decline of freely available cobblestones coincided, coincidentally, with the emergence of a revolutionary new paving material called sheet asphalt, first used successfully in the United States in 1870 in Newark, New Jersey.[55] In 1881, the City of Savannah granted the International Pavement Company of New York "permission to lay down … as an experiment … a small quantity of their patent Asphalt pavement immediately in front of the City Exchange, the conditions being that if it proved satisfactory for the term of five years from the time it was laid, the city should pay for it at the rate of $2.10 per square yard."[56] The experiment proved successful, and in 1886 the city began employing sheet asphalt for selected major streets downtown, beginning with Broughton Street, the principal shopping corridor. The Warren-Sharf Asphalt Paving Company of New York received most of the orders, charging $2.35 per square yard.[57] A city map of 1891 shows asphalt employed on Bull Street, the central north-south street of the city (including the areas around its five squares), Drayton Street, and the central three east-west avenues – Broughton Street, South Broad Street (later renamed Oglethorpe Avenue), and Liberty Street.[58] The cost of paving different streets with asphalt quickly escalated, ranging in 1890 from $3.60 per frontage foot on Harris Street, to $4.88 per frontage foot on Bull Street, to a high of $5.88 per frontage foot for Liberty Street, where a combination of asphalt with brick crossings was used.[59] By comparison, paving Drayton Street with oyster shells cost only $0.16 per frontage foot. Cost, in fact, became a decisive factor limiting the use of sheet asphalt to a relatively few important streets in Savannah.

Surprisingly, asphalt also had *higher* maintenance costs than any other form of pavement. As noted by Savannah Public Works Commissioner Harry Willink:

> It will be seen that the cost of cleaning asphalt streets is about five times that of cleaning shell, cobble or granite. Asphalt, while a pretty pavement, and as claimed by some the most sanitary of all pavements, unless kept absolutely clean speedily becomes the most unsanitary and injurious to the public's health as well as offensive to its eyes. It accordingly requires more attention than any other class of pavements. The method of cleaning also makes it especially expensive. The work is done by hand scrapers, the dirt being collected by carts as deposited in piles by the scrapers, … [whereas] the wetting required to prevent dust is injurious to the asphalt.[60]

This contradicts the assertions of New York City Street Cleaning Commissioner, George Waring, who in the 1890s "argued that sanitation workers could clean asphalt streets more completely and cheaply than the traditional block pavements."[61] Subsequent forms of asphalt still needed to be kept clean but were no longer negatively affected by water, given the practice of cleaning asphalt with water sprayed from street-cleaning trucks by at least 1905.[62]

With cobblestones no longer available cheaply and asphalt too expensive for broad application, the city experimented from the late 1880s onward with other materials that reconciled economy and performance, namely granite blocks and oyster shells, before eventually settling on vitrified brick and asphalt blocks. Granite blocks (otherwise called setts or Belgian blocks) were employed wherever heavy traffic outweighed concern for a smooth ride. First used in 1888 in Savannah, parts of fourteen streets were paved with granite blocks, at least up through 1912, when one of the two surviving streets with Belgian blocks, Bay Street Lane, was paved.[63] Although the material itself was relatively cheap, it had to be imported. To pave roughly 1,500 feet of East Broad Street – from Oglethorpe Avenue to Jones Street – in 1891 required 9,172 square yards of granite blocks shipped from Macon, Georgia, to Savannah on 123 railway freight cars, at a cost of $2.33 per frontage foot,[64] a price marginally cheaper than asphalt at the time and that included the cost of shipping. By 1917, 13.4 percent (6.9 miles) of the city's paved streets employed granite blocks,[65] of which only the block-long stretch of Bay Street Lane (between Jefferson and Montgomery Streets) paved in 1912 and the half-mile stretch of River Street (between Barnard and Houston Streets) retain this type of pavement (Fig. 6).

As they had done previously with the ballast stone, Savannah engineers took advantage of a natural regional resource as an unconventional and cheap paving option – oyster shells. Its use, at first, was inhibited by limited supply. In 1867, the city surveyor, John B. Hogg, mentioned how "I have endeavored during the winter to obtain shell sufficient to cover that portion of Bull Street from Bay Street and Johnson Square, from the ordinary supply from the eating houses, but have not yet completed even this small distance."[66] Although sufficient shells were available by 1870 for the city to propose paving South Broad Street (later Oglethorpe Avenue) with shells, residents filed a petition against the work, claiming "that the Shelling of the said Street will prove not only injurious to the value of our property on that Street, but also will to a great extent destroy the domestic comfort of our residences upon it"; the city yielded to the protest and canceled the project.[67] The arrival of oyster canning factories in the coastal lowcountry around Savannah in the 1880s appears to have solved the supply problem.[68] While only New Orleans is noted by Tillson in his

pavement manual of 1900 as using oyster shells,[69] Savannah had made extensive use of this local resource, paving parts of at least twenty-two streets between 1891 and 1895 with the material.[70] To pave Gaston Street in 1891, for example, required 62,260 bushels of oysters.[71] Such pavement provided "a nice, smooth, pleasing surface for light driving, but of course would not stand heavy traffic," according to Tillson.[72] In 1895, the City Engineer W. J. Winn concluded, "oyster shells do well at first, but under heavy traffic the surface soon becomes pulverized, causing dust in dry and mud in wet weather."[73] In fact, the unsuitability of oyster shell pavement for streets carrying heavy traffic was quickly proven when Jefferson Street on the west side of downtown was repaved in 1893 with granite just one year after being paved with shells.[74] As late as 1912, however, oyster shells persisted on significant stretches of three streets in the area around Forsyth Park, just south of downtown, and parts of three streets in the outskirts, as well as the downtown streets around Telfair Square, a striking anomaly, but where the devastating urban fire of 1889 may have delayed the need for repaving (Fig. 7).[75] Today, at least one street in Savannah, Bracken Lane (about three miles south of downtown), retains its shell pavement, while the original material on Shell Road on the city's east side survives only in the street's name.

A specific genre of urban map developed across North America in the late nineteenth century represented the diverse pavements with different colors. The map of street pavement in Savannah from 1906, updated through 1912 (Fig. 7), is typical. It documents ten different materials– asphalt, granite blocks, cobblestone, greywacke, brick, chert, gravel, shell, asphalt block, and pyrites – reflecting a greater variety of materials than in most other cities. Similar maps of Omaha, Nebraska, display seven materials in 1890 and five in 1905, while maps of Minneapolis display four in 1895 and six in 1899. Only a 1907 map of Toronto displays more types of pavement, with eleven.[76] These maps vividly illustrate the highly experimental and at times seemingly random use of paving materials.

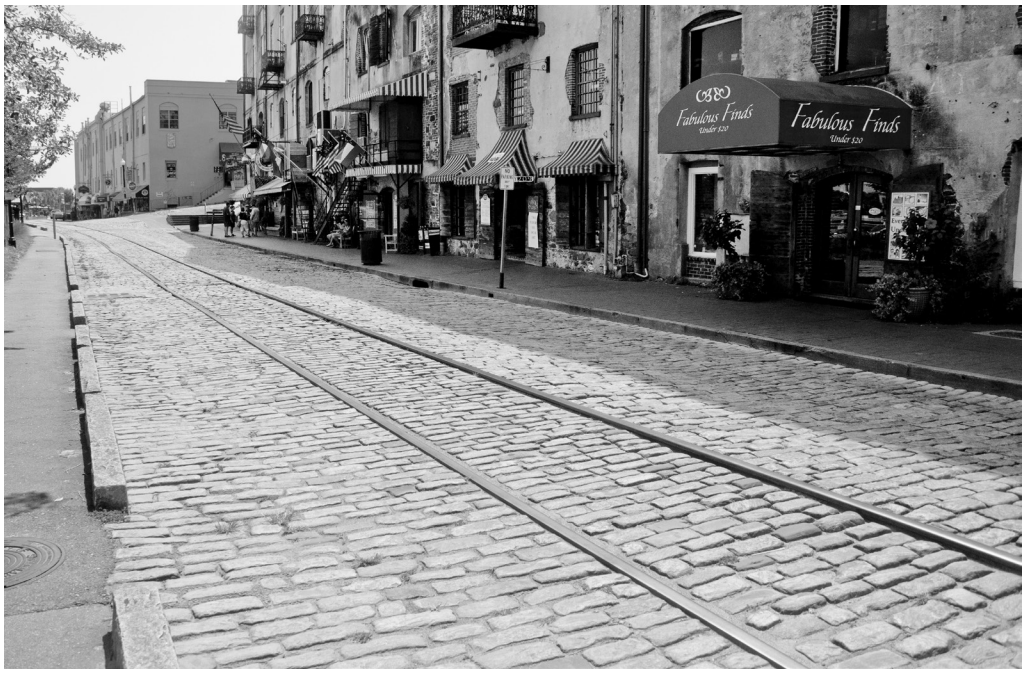


Figure 6
Belgian block pavement on River Street, Savannah, 2013, looking east.

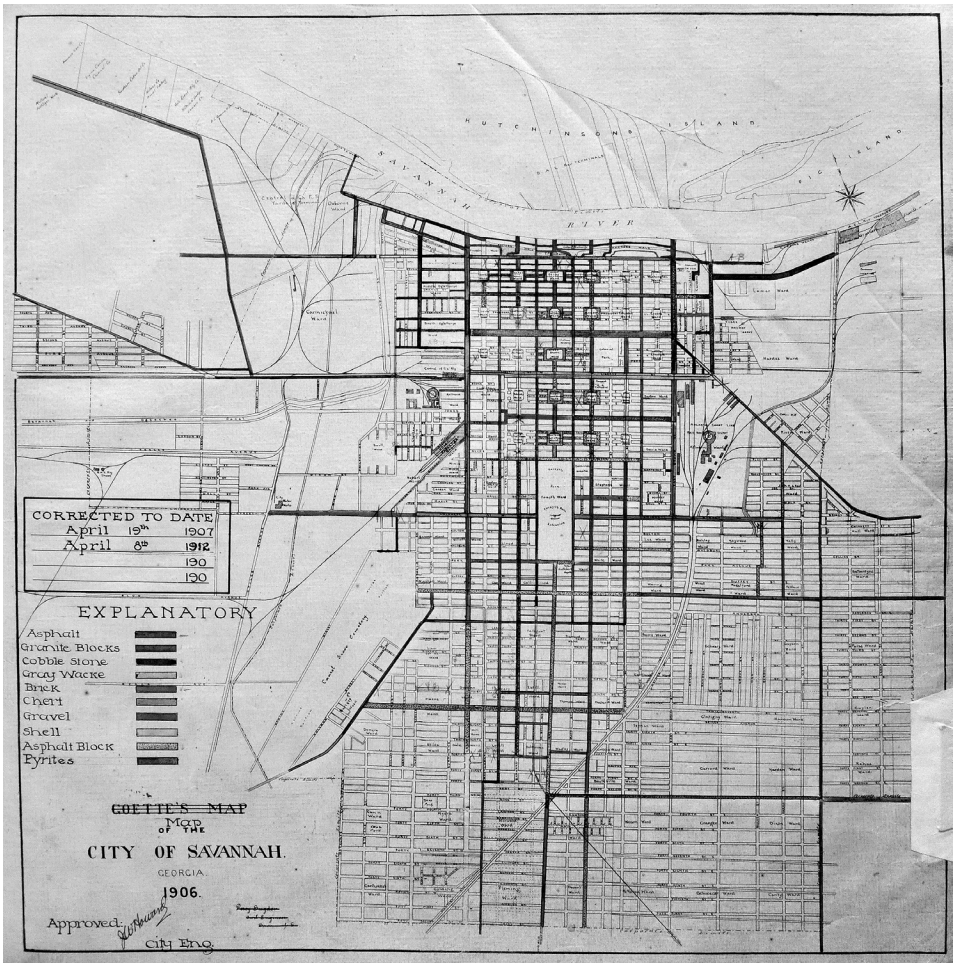


Figure 7
Map of City of Savannah: Pavement, 1906, amended through 1912 (Record Series 5600EN-90, Engineering Department – Engineering Maps, Volume 1, courtesy City of Savannah, Research Library and Municipal Archives. Used with permission).

REGIONAL PATTERNS IN PAYING FOR PAVEMENT

Three different patterns of paying for pavement were employed by American municipalities in the nineteenth and early twentieth centuries. Of fifty cities surveyed across the United States by Ira Osborn Baker in 1903, thirty-one levied all of the cost onto property owners fronting the street, the so-called "abutters" (including only one southern city -- Louisville, Kentucky); eleven cities (six in New England and three in the South – Richmond, Nashville, and Charleston) had the municipalities absorb all of the cost; in only eight cities, five of which were in the South (Montgomery, Alabama; Atlanta; Augusta, Georgia; New Orleans; and Jacksonville) divided the cost between the municipality and the abutters, with the latter shouldering 50 to 75 percent of the cost.[77] Savannah conformed to the prevailing southern regional practice, assigning two-thirds of the cost to the abutters. According to Clay McShane, this practice empowered the abutters to decide if and when the street in front of their property would be paved.[78] Typically, once two-thirds of abutters agreed to have their street paved and selected a type of pavement, the city would engage a contractor and assess the total cost to property owners through municipal taxes. This practice favored more affluent neighborhoods, where abutters would be willing to pay higher property taxes. In Savannah, despite

the abutters paying for two-thirds of the cost, the city determined the location, timing, and type of pavement to be used, putting local residents in a defensive position, such as the residents of South Broad Street who in 1870 had to petition the mayor to discontinue a proposed paving of that street with shells. On other occasions, abutters had to petition the city to improve their streets, with no guarantee the city would do so. Even after the City of Savannah passed a new municipal law on August 18, 1919, the so-called Oklahoma Plan Act, requiring abutters to pay all of the cost of pavement, formal petitions and private letters still arrived at city hall. For example, one resident complained about the "paving of Maupas Ave. which I understand the City has decided to do without consulting the property owners. I have canvassed the property owners on this street, living in their own homes, pretty thoroughly, and have not found a single owner that was in favor of paving."[79] Opposition to the City of Savannah's new Oklahoma Plan Act motivated a group of citizens to take the city to court. The case ended up in the Georgia Supreme Court, which ruled against the city and overturned the law on February 16, 1922.[80]

TOWARDS SMOOTHER PAVEMENT: THE EMERGENCE OF VITRIFIED BRICK AND ASPHALT BLOCKS

One would expect the invention of the automobile to have been behind the shift from hard but bumpy cobblestone and granite block pavement to brick and other smoother paving materials. In fact, two decades prior to the development of the automobile, bicycle enthusiasts spearheaded the "good roads movement."[81] Beginning in 1880 in Newport, Rhode Island, the League of American Wheelman became a national movement and found its voice with the publication, beginning in 1891, of the *Good Roads Magazine*. Albert Pope, a Civil War veteran and the manufacturer of Columbia bicycles, funded and organized a petition requesting the creation of a federal Government Roads Department.[82] The petition was partially successful, leading to the creation of the Office of Road Inquiry in 1893. Cycling reached its zenith in the mid- to late 1890s,[83] those same years Savannah witnessed the abandonment of oyster shell roads in 1895 and granite block by 1897. Although sheet asphalt offered the smoothest possible surface and had been used in Savannah since 1881, the move to smoother pavements in Savannah led to the use of vitrified brick, and after 1906, of asphalt block.

By the end of the nineteenth century, vitrified brick quickly became very popular in Savannah as it did in many other cities, promoted as being "cheaper in construction and more economic in maintenance, … as noiseless as asphalt and almost as durable as granite."[84] Although bricks had been around for millennia, "the normal, relatively soft bricks adequate for most building purposes did not hold up under heavy traffic." This changed when "brick makers learned to produce dense, vitrified brick that resisted abrasion and minimized the absorption of moisture."[85] The use of vitrified brick appears to have been most popular in the American Midwest, where its development advanced during the 1880s.[86] Beginning in 1896, many streets in Savannah would be paved with this material, often replacing oyster shell streets, such as Jones Street, shortly after the turn of the century (Fig. 8). Within a decade, there was twice as much vitrified brick pavement throughout the city as either asphalt or granite block,[87] and by 1912, most of the paved streets south of Gaston Street (the traditional southern boundary of downtown) were graced with bricks in a variety of colors, depending on the vendor, ranging from dark purple to beige, with red being most common.

Figure 8
Red brick pavement on East Jones Street, Savannah, 2013, looking west from Drayton Street.

Among the various types of historic pavement surviving in downtown Savannah, none appears more pervasively or distinctly than asphalt blocks. Made of asphaltic cement and pulverized rock and formed into large bricks, typically 5 x 12 inches, asphalt blocks were slow to catch on during the second half of the nineteenth century. First used in Paris in 1824, they made their American debut in San Francisco in 1869.[88] By 1880, the manufacturing process had become mechanized and involved the constituent materials, according to an article in *Popular Science Monthly* in 1902, being "thoroughly incorporated together and pressed out while hot in a sort of brick-machine of great power, which renders the block as solid as the materials can be made."[89] Considered by municipal officials in Savannah as early as 1890,[90] it was only after 1906 that many streets in Savannah were repaved with the material. Although not as resistant to heavy traffic as sheet asphalt, asphalt blocks were more durable and lasted longer under moderate conditions, such as one would find on a residential street. Indeed, asphalt-block pavement remains visible around all or parts of ten downtown Savannah squares, as well as four blocks of Jones Street.

The success of asphalt blocks in Savannah attracted inquiries from other cities and, according to E.E. Conant, Chief Engineer in Savannah, was due to the nature of the city's sandy soil. He reported that:

> Many inquiries have come from engineers as to the method followed, and a certain of the success of this class of pavement in Savannah, where in many of the streets there has not been a dollar expended in the maintenance of same. The success is due largely to the character of the soil upon which the block is placed, there being sand with a small amount of loam intermixed, where clay was encountered, we have had some work fail, due to moisture getting under the block and allowing a rocking motion to same. With the sand loam strata excellent drainage is afforded, which is absolutely necessary for the success of asphalt block pavement laid in the manner referred to above. … Cities in Florida have tried to lay block on sand foundation, but have not met with [the] success that we have had here.[91]

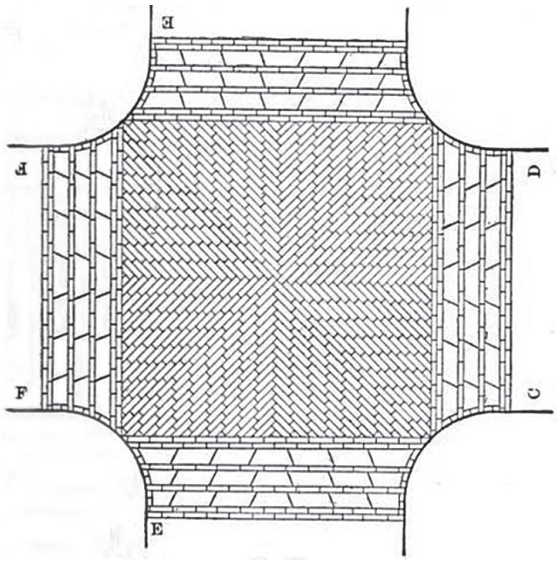
Conant's account underscores the degree to which the effectiveness of pavement depended on local conditions. He also noted how economics and not performance issues brought an end to the use of asphalt blocks in Savannah by 1916: "On account of the high freight rate here, asphalt block at this time is out of the question," observing that shipping costs were 30 to 50 percent higher than in past years.[92]

Economics simultaneously encouraged the use of concrete in Savannah, beginning in 1915, even though other municipalities "were reluctant to pave with concrete because of the frequency with which city streets had to be torn up to tap water, gas, and sewer lines."[93] As reported in 1916, one square yard of concrete cost less than all other materials except cobblestone: cobble $1.1862, concrete $1.5259, vitrified brick $1.5407, asphalt block $1.7916, granite block $1.9072, and sheet asphalt $2.5713.[94] Chief Engineer Conant noted that even concrete was subject to regional and topographical considerations: "Savannah is south of the heavy frost line and there are never more than two or three days of freezing weather together so that there is no danger of pavements being heaved by frost. … The pavement, of course, is not suitable for all streets and lanes, but is especially suitable where there is moderate traffic and where the grades are not too great."[95]

ADAPTING PAVEMENT ENGINEERING PRINCIPLES TO LOCAL CONDITIONS

City engineers in Savannah followed advanced pavement principles for both vitrified brick and asphalt blocks by laying bricks in intersections in a diagonal formation. This pattern was advocated by Tillson in his pavement manual, "to have traffic, wherever possible, at right angles with the blocks."[96] That is, bricks or blocks are laid with their long dimension perpendicular to the direction of traffic. In intersections, where vehicles turn, laying bricks on a diagonal allows them to remain perpendicular to the angle of the wheels. The resulting "X" formation, as illustrated by Tillson, remains visible in a few intersections in Savannah (Figs. 9, 10). The peculiar nature of the Savannah plan, however, where T-shaped intersections predominate because of the presence of squares, inspired a widely used local variant, forming large triangles of diagonally angled bricks, with some squares having as many as eight. Across downtown Savannah one can find full triangles, variously blunted triangles and in one location, the asphalt-block pavement incorporates a pair of smaller triangles (Figs. 11, 12). Remarkably, Savannah's street maintenance department continues to use new asphalt blocks to replace damaged ones, as the lighter (newer) blocks in the figures illustrate.

The numerous triangles provide lingering evidence of how traffic originally moved on the streets. Prior to the implementation of one-way streets in the 1930s, traffic was allowed to travel around the squares in both directions, whereas today traffic flows counterclockwise in the manner of a roundabout. In other words, half of each triangle at the corners of the squares is now unnecessary (such as the left half of the triangle in Fig. 12). A unique and extremely blunted triangular formation exists on York Street, along the southern flank of the federal post office and courthouse (Fig. 13). Given the purpose for such triangular block formations, this one makes no sense until it is recalled that the original loading dock for mail carriages was located here (Fig. 14) prior to the expansion of the 1895 building in the 1930s and relocation of the loading dock to the western side facing Whitaker Street. Like a palimpsest, Savannah's pavement reveals changing urban form and practices.



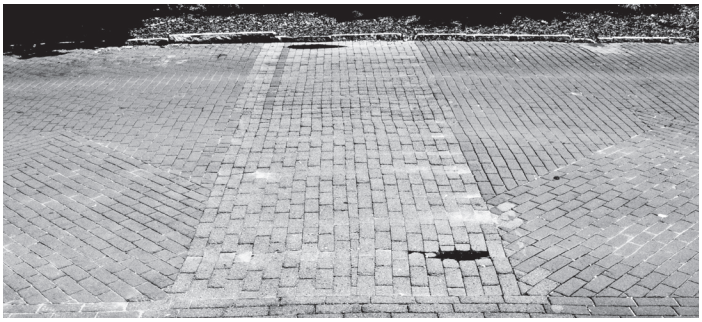


Figure 9 (top left)
Pavement diagram (George W. Tillson, Street Pavements and Paving Materials (New York: John Wiley & Sons, 1900), 195, fig.11).

Figure 10 (top right)
Brick pavement at the intersection of Lincoln Street and East 31st Street, Savannah, 2013, looking west.

Figure 11 (middle left)
Asphalt-block pavement laid in a triangular formation at the intersection of Barnard Street and West Gordon Street, Savannah, 2013, looking north.

Figure 12 (middle right)
Asphalt-block pavement laid in paired triangular formations at the intersection of Abercorn Street and East President Street, 2013, looking east.

Figure 13 (bottom left)
Asphalt-block pavement on West York Street with south elevation of US Post Office and Courthouse, 2013, looking east.

Figure 14
US Post Office and Courthouse, Savannah, c.1910, detail of original loading bay on the York Street rear facade (Foltz Photography Studio (Savannah, Ga.) Collection, MS 1360-04-08-07, courtesy Georgia Historical Society, Savannah, Georgia).

THE LOCAL AND REGIONAL NATURE OF PAVEMENT

One would have expected that the arrival of asphalt in the 1870s nationally and by 1881 in Savannah would have solved the problem of becoming a well-paved city. Yet, the experience of various city surveyors and municipal engineers in Savannah shows that the road to modern asphalt was neither as direct nor as obvious as historians have suggested. Judging by the municipal pavement maps of the 1890s and early 1900s from other cities around the continent, Savannah was not alone in this struggle. Regionalism and localism exerted strong influences.

Beyond the insight one can gain from the various struggles its municipal engineers faced between the 1850s and 1920, Savannah offers an additional window to the past – and perhaps to the future. Unlike most other cities (perhaps due to a kinder climate with less frost and no need for snow plows), Savannah preserves many stretches of diverse historic pavements and their respective techniques. It remains a city of multiple surfaces: in downtown alone one can find streets of cobblestones, Belgian blocks, three different kinds of vitrified brick, asphalt block, concrete with either granite or oyster shell aggregate, gravel, stamped asphalt, and, of course, regular asphalt. As part of the material landscape, historic pavements continue to lend specific identities to different streets and areas, providing a welcome alternative to the ubiquity of asphalt. From a practical point of view, they also offer tangible evidence of how different paving surfaces can impact driver behavior as the rumble of tires on block, brick, or cobbled surfaces typically inspires a slower speed. With the rise in environmental interest in permeable pavement, alternatives to conventional asphalt once again offer symbols of modernity.

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ENDNOTES

1. *Annual Report of Herman Myers, Mayor of the City of Savannah, for the Year Ending December 31, 1896* (Savannah: The Morning News Print, 1897), 13-14.

2. *Report of Hon. Herman Myers, Mayor, together with the Reports of the City Officers of the City of Savannah, Georgia, for the Year ending December 31st, 1905* (Savannah: Braid & Hutton, [1906]), 15-16.

3. Untitled articles, *Savannah Daily Morning News*, June 28, 1852, p.2, col.1; and August 4, 1864, p.2, col.2; Untitled articles, *Daily News Herald* (Savannah), March 1, 1867, p.3, col.2; and September 17, 1867, p.3, col.1.

4. Untitled article, *Daily News Herald* (Savannah), April 12, 1867, p.3, col.2. The complaint echoed the contemporaneous complaint by Haussmann about Napoleon III's love of macadam, which required Parisians "either to keep a carriage or to walk on stilts"; see David Pinckney, *Napoleon III and the Rebuilding of Paris*, 70-72, quoted in Marshall Berman, *All That is Solid Melts Into Air: The Experience of Modernity* (New York: Simon and Schuster, 1982), 158-59.

5. Bob Arnebeck, "A Short History of Yellow Fever in the US." Accessed October 17, 2009 from http://www.geocities.com/bobarnebeck/history.html.

6. Untitled article, *Savannah Daily Herald*, March 26, 1866, p.3, col.1.

7. Carlton Reid, "The Petition that paved America," *Roads were not Built for Cars* website, March 21, 2012. Accessed February 24, 2013 from http://www.roadswerenotbuiltforcars.com/the-petition-that-paved-america/

8. Clay McShane, "Transforming the Use of Urban Space: A Look at the Revolution in Street Pavements, 1880-1924," *Journal of Urban History* V (May 1979): 283.

9. Sprio Kostof, *The City Assembled: The Elements of Urban Form through History* (Boston: Little, Brown, 1992), 212. Other architectural and urban historians addressing pavement include Carl Bridenbaugh, who discusses pavement in colonial cities in his *Cities In Revolt: Urban Life In America, 1743-1776* (New York: Alfred A. Knopf, 1965), 29-30, 58, 238-39; Marshall Berman famously discusses Baudelaire's characterization of the modern city by the phrase "The Mire of the Macadam," in *All That Is Solid Melts Into Air*, 155-64; Rodolphe el-Khoury analyzed French fears of unhealthy vapors rising from the ground and the use of pavement to contain them, in "Polish and Deodorize: Paving the City in Late-Eighteenth-Century France." *Assemblage* 31 (December 1, 1996): 7-15; and Dell Upton briefly mentions noise issues related to pavement in *Another City: Urban Life and Urban Spaces in the New American Republic* (New Haven and London: Yale University Press, 2008), 66-67.

10. McShane, 1979, 279. See also Clay McShane, *Down the Asphalt Path: The Automobile and the American City* (New York: Columbia University Press, 1994), especially chapter 4, "The Uses and Abuses of Streets"; the detailed discussion about the evolution of asphalt in I. B. Holley Jr., "Blacktop: How Asphalt Paving Came to the Urban United States," *Technology and Culture* 44: 4 (October 2003): 703-33; and Joel A. Tarr, "The Evolution of Urban Infrastructure in the Nineteenth and Twentieth Centuries," in *Perspectives on Urban Infrastructure*, ed. Royce Hanson (Washington, DC: National Academy Press, 1984), 11.

11. *Annual Message to City Council of Hon. Wallace J. Pierpont, Mayor, on the Finances and Improvements of 1917 together with the Reports of the City Offices of the City of Savannah, Georgia, Year Ending December 31, 1917* (Savannah: Commercial Lithograph & Printing Co., [1918]), 225.

12. For example, asphalt amounted to 51 percent of all pavement in 1915 in Baltimore, while granite block was used 25 percent of the time, and vitrified brick 20 percent. See Paving Commission of the City of Baltimore, "Map Showing Streets Paved with Improved Paving to December 31, 1915," Jscholarship website, accessed February 22, 2013 from http://jhir.library.jhu.edu/handle/1774.2/35389.

13. See George W. Tillson, *Street Pavements and Paving Materials. A Manual of City Pavements: The Methods and Materials of their Construction* (New York: John Wiley & Sons, 1900), 136.

14. Carl Bridenbaugh, *Cities in the Wilderness: The First Century of Urban Life in America, 1625-1742* (New York: Alfred A. Knopf, 1955), 155-59.

15. By 1817, all of the city's trees were placed "under the special care and protection of the Mayor and Aldermen". Ordinance, June 7, 1817. City of Savannah Ordinances, 1787-1817, p.292.

16. Untitled article, *Savannah Daily Herald*, February 1, 1865, p.2, col.2.

17. *Report of John Screven, Mayor of the City of Savannah, for the Year Ending September 30, 1870* (Savannah: Morning News Steam-Power Press, 1870), 61.

18. *Report of John F. Wheaton, Mayor of the City of Savannah, for the Year ending December 31, 1879* (Savannah: Morning News Steam Printing House, 1880), 43-44.

19. "1823 - First American Macadam Road," The Paintings of Carl Rakeman, U.S. Department of Transportation, Federal Highway Administration. Accessed October 10, 2009 from http://www.fhwa.dot.gov/rakeman/1823.htm.

20. Carl Abbott, "Plank Roads and Wood-Block Pavements," *Journal of Forest History* 25: 4 (October 1981): 216.

21. Daniel B. Klein and John Majewski, "Turnpikes and Toll Roads in Nineteenth-Century America," EH Net Encyclopedia. Accessed October 22, 2013 from http://eh.net/encyclopedia/turnpikes-and-toll-roads-in-nineteenth-century-america/.

22. *Report of James P. Screven, Mayor of the City of Savannah, for the Year ending September 30th, 1857* (Savannah: E.J. Purse, 1857), 11.

23. Klein and Majewski, "Turnpikes and Toll Roads in Nineteenth-Century America."

24. *Daily Morning News*, October 25, 1859, p.2, col.1.

25. "Letter, John B. Hogg, City Surveyor, to Dr. Jas. J. Waring, Chairman, Streets and Lane Committee, City of Savannah, March 5, 1867," Record Series 0115-001 (PAV), City Council Meeting Papers, Board of Appraisers, Box 0115-001-A189, Folder 1: Paving Reports 1860, 1867-1869. City of Savannah, Research Library and Municipal Archives.

26. *Report of John Screven, Mayor of the City of Savannah, for the Year Ending September 30, 1870* (Savannah: Morning News Steam-Power Press, 1870), 13.

27. *Report of John Screven,* 61, refers to the pavement as "Stowe's Patent," but a copy of the company's promotional pamphlet provides the more formal name. Wood block pavement had been used in New York as early as 1837. See "Wooden Pavements," *The New-York Mirror*, Saturday, November 18, 1837.

28. "To the Corporate Authorities and Property Owners of the Cities of the United States," received by Mayor of Savannah, November 24, 1869, Record Series 0115-001(PAV), City Council Meeting Papers, Board of Appraisers, Box 0115-001-A189, Folder 1: Paving Reports, 1860; 1867-1869. City of Savannah, Research Library and Municipal Archives.

29. *Report of John Screven, Mayor of the City of Savannah, for the Year Ending September 30, 1870*, 13.

30. *Ibid.*

31. Nicolson had patented his wood block pavement in 1854 and later published *The Nicolson Pavement, Invented by Samuel Nicolson, of Boston, Mass.* (Boston: Henry W. Dutton & Son, 1859).

32. "Letter, N.R. Nelson to the Mayor and Board of Aldermen of the City of Savannah, November 23, 1869," Record Series 0115-001(PAV), City Council Meeting Papers, Board of Appraisers, Box 0115-001-A189, Folder 1: Paving Reports, 1860; 1867-1869. City of Savannah, Research Library and Municipal Archives.

33. *Report of John F. Wheaton, Mayor of the City of Savannah, for the Year ending December 31, 1879* (Savannah: Morning News Steam Printing House, 1880), 43.

34. See "Resolution of S. & L. Com. on `Stowe Pavement' adopted by Mayor January 28, 1874," Record Series 0115-001(PAV), City Council Meeting Papers, Board of Appraisers, Box 0115-001-A189, Folder 2. City of Savannah, Research Library and Municipal Archives.

35. Kostof, 210-11; "Early Omaha: Gateway to the West," Omaha Public Library website, accessed February 25, 2013 from http://digital.omahapubliclibrary.org/earlyomaha/map_gallery.html. Wood block paving survives in Savannah inside the Central of Georgia roundhouse, which is today part of the Roundhouse Museum, where its porous nature was well suited to soaking up grease dripped from locomotives and provided a more yielding surface for dropped cast iron tools.

36. Greywacke is also spelled graywacke or gray wacke.

37. *Report of John Screven, Mayor of the City of Savannah, for the Year Ending September 30, 1870*, 13 and 61.

38. *Report of John Screven, Mayor of the City of Savannah, for the Year Ending September 30, 1870*, 13.

39. For its continued presence through 1912, see "Map of City of Savannah: Pavement, 1906 (amended through 1912)," Record Series 5600EN-90, Engineering Department – Engineering Maps, Volume 1. City of Savannah, Research Library and Municipal Archives.

40. "Untitled resolution, dated and adopted October 30, 1878," Record Series 0115-001(PAV), City Council Meeting Papers, Board of Appraisers, Box 0115-001-A189, Folder 2. City of Savannah, Research Library and Municipal Archives.

41. *Fifth Annual Report of John F. Wheaton, Mayor of the City of Savannah, Year Ending December 31, 1881* (Savannah: George N. Nichols, [1882]), 12.

42. Thomas Gamble, *A History of the City Government of Savannah, Georgia, from 1790 to 1901* (Savannah: 1900), 420-421; as late as 1912, these two streets remained the only ones identified using greywacke; see "Map of City of Savannah: Pavement, 1906 (amended through 1912)," Record Series 5600EN-90, Engineering Department – Engineering Maps, Volume 1. City of Savannah, Research Library and Municipal Archives.

43. "Early Omaha: Gateway to the West," Omaha Public Library website, accessed February 25, 2013. http://digital.omahapubliclibrary.org/earlyomaha/map_gallery.html

44. Joel A. Tarr, "The Evolution of Urban Infrastructure in the Nineteenth and Twentieth Centuries," in *Perspectives on Urban Infrastructure*, ed. Royce Hanson (Washington, D.C.: National Academy Press, 1984), 11.

45. City of Savannah Minutes of Council, August 10, 1843, p.68, Record Series 5600CL-005.1-A, 1843-1844 Volume. City of Savannah, Research Library and Municipal Archives. The minutes contain a committee report that mentions that one street had already been paved and advocated the paving of the other ramps with stone obtained from ballast.

46. W. M. Gillespie, *A manual of the principles and practice of road-making: comprising the location, construction, and improvement of roads (common, macadam, paved, plank, etc.); and railroads* (New York: A.S. Barnes & Co., 1848), 216-17.

47. Gamble, 419.

48. *Daily Morning News*, April 6, 1855, p.1, col.1

49. *Report of Edward C. Anderson, Mayor of the City of Savannah, for the Year ending September 30, 1866* (Savannah: C.E. O'Sullivan, Printer, 1866), 5.

50. *Report of Edward C. Anderson, Mayor of the City of Savannah, for the Year ending September 30, 1867* (Savannah: C.E. O'Sullivan, Printer, 1867), 11, is the last reference in the mayoral reports of work on the retaining walls or paving of the ramps.

51. Gamble, 419.

52. Eric Meyerhoff, interview with author, Savannah, 7 November 2013.

53. *Ibid*.

54. Finding aid, Record Series 6210-001.3, Buildings and Grounds Department-Riverfront Artifacts: Whitaker Ramp Site. City of Savannah, Research Library and Municipal Archives.

55. Holley, "Blacktop," 708.

56. *Fifth Annual Report of John F. Wheaton, Mayor of the City of Savannah, Year Ending December 31, 1881*, 12.

57. "Street Paving Record Book, 1887-1895," Record Series 5600EN-80, Engineering Department, Street Paving Record Books, Volume 1. City of Savannah, Research Library and Municipal Archives.

58. "New Map of the City of Savannah, GA," William A. Flamm & Co., Baltimore, 1891, Record Series 3121-007, Engineering Department, Retrospective Maps Collection: General Maps, Map #XA-13. City of Savannah, Research Library and Municipal Archives.

59. "Street Paving Record Book, 1887-1895."

60. *Annual Report of Herman Myers, Mayor of the City of Savannah, for the Year Ending December 31, 1896*, 156-157.

61. Quoted in McShane, 1979, 295.

62. Kostof, 212, shows a photograph of street-cleaning trucks on Pennsylvania Avenue in Washington, DC, dated 1905.

63. "Bill For Paving Bay Street Lane," Record Series 5600EN-80, Engineering Department, Street Paving Record Books, Volume 4. City of Savannah, Research Library and Municipal Archives. Thomas Gamble wrongly asserted that the use of granite blocks was discontinued after 1897. See Gamble, *History of City Government*, 420-421.

64. "Street Paving Record Book, 1887-1895."

65. *Annual Message to City Council of Hon. Wallace J. Pierpont, Mayor, on the Finances and Improvements of 1917 together with the Reports of the City Offices of the City of Savannah, Georgia, Year Ending December 31, 1917* (Savannah: Commercial Lithograph & Printing Co., [1918]), 225.

66. Letter, John B. Hogg, City Surveyor, to Dr. Jas. J. Waring, Chairman, Streets and Lane Committee, City of Savannah, March 5, 1867. City Council Meeting Papers, BOX # PAV 1, Record Series 0115-001-A189, Folder 1: Paving Reports, 1860; 1867-1869, City of Savannah, Research Library and Municipal Archives.

67. See "Application of the Owners of Property on South Broad Street asking Council to stop the work of shelling Said Street," signed by 26 owners, undated; approved by the Mayor, March 16, 1870, Record Series 0115-001(PAV), City Council Meeting Papers, Board of Appraisers, Box 0115-001-A189, Folder 2. City of Savannah, Research Library and Municipal Archives.

68. For example, L.P. Maggioni and Company opened an oyster factory on nearby Daufuskie Island in 1883. See the finding aid for the L.P. Maggioni and Company records, 1883-1982, MS 1893, Georgia Historical Society, Savannah, Georgia. For more information about the oyster industry, see Victor G. Burrell, Jr., *South Carolina Oyster Industry: A History* (Charleston: V. G. Burrell Publ., 2003).

69. Tillson, 142.

70. *Annual Report of Herman Myers, Mayor of the City of Savannah, for the Year Ending December 31, 1895* (Savannah: The Morning News Press, 1896), 17-18.

71. "Street Paving Record Book, 1887-1895."

72. Tillson, 142. This view was expressed by Mayor Herman Myers in 1895: "Shells have proved unsatisfactory where there is heavy traffic. Drayton and Jefferson streets amply illustrated this." See *Annual Report of Herman Myers, Mayor of the City of Savannah, for the Year Ending December 31, 1895*, 17.

73. *Annual Report of Herman Myers, Mayor of the City of Savannah, for the Year Ending December 31, 1895*, 83.

74. Gamble, 421. The 1893 Mayoral Report acknowledged this issue, stating: "It has become apparent that the shells laid on Jefferson street will not bear heavy travel and that something will soon have to be done toward the improvement of this street. It is probable that this matter will be taken up without delay and a substantial pavement laid, such as will meet all requirements" (p.12).

75. See "Map of City of Savannah: Pavement, 1906 (amended through 1912)," Record Series 5600EN-90, Engineering Department – Engineering Maps, Volume 1, City of Savannah, Research Library and Municipal Archives.

76. Reproduced in Derek Hayes, *Historical Atlas of Toronto* (Vancouver and Toronto: Douglas & McIntyre, 2008), 136, map 210.

77. Ira Osborn Baker, *A Treatise on Roads and Pavements* (New York: John Wiley & Sons, 1903), 298. Tillson's survey of 15 cities nationwide corroborates Baker's findings, with only Atlanta and New Orleans not charging all costs to the abutters. See Tillson, 138.

78. McShane, 1979, 284.

79. "Letter, John L. Cheney to Thomas Halligan, Clerk, City of Savannah, October 6, 1919," Record Series 0115-001(PAV), City Council Meeting Papers, Board of Appraisers, Box 0115-001-A189, Folder 4. City of Savannah, Research Library and Municipal Archives.

80. "Wilkins et al. v. Mayor and Aldermen of Savannah (no. 2491)," *The Southeastern Reporter* 111 (St. Paul: West Publishing Co., 1922), 42-45. Accessed February 28, 2013 from http://books.google.com/books?id=yhYLAAAAYAAJ&pg=PA43&lpg=PA43&dq=1919+Oklahoma+plan+savannah+law&source=bl&ots=3CpwcXgXtk&sig=X2ZxB_EkZJFCJWHL2---hJzW5Z0&hl=en&sa=X&ei=MRIwUd_KDoOs8QTO2YGQDQ&ved=0CC0Q6AEwAA#v=onepage&q=1919%20Oklahoma%20plan%20savannah%20law&f=false

81. Carlton Reid, "The Petition that paved America," Roads were not Built for Cars website, March 21, 2012. Accessed February 24, 2013 from http://www.roadswerenotbuiltforcars.com/the-petition-that-paved-america/

82. *Ibid*.

83. Ron Spreng, "The 1890s Bicycling Craze in the Red River Valley," Minnesota History Website, Minnesota Historical Society. Accessed February 15, 2013 from http://www.mnhs.org/market/mhspress/minnesotahistory/featuredarticles/5406268-282/index.htm

84. *Annual Report of Herman Myers, Mayor of the City of Savannah, for the Year Ending December 31, 1895*, 84.

85. Holley, 705.

86. J.G. Shea, "Brick for street-paving," *Science* 13: 326 (May 3, 1889): 335-36.

87. *Annual Report of Herman Myers, Mayor of the City of Savannah, for the Year Ending December 31, 1896*, 117.

88. Ira Osborn Baker, *A Treatise on Roads and Pavements*, 2nd ed. (New York: John Wiley & Sons; London: Chapman & Hall, 1913), 448.

89. S.F. Peckham, "A Modern Street," Popular Science 61 (July 1902): 214-15. Accessed October 20, 2013, from http://en.wikisource.org/wiki/Popular_Science_Monthly/Volume_61/July_1902/A_Modern_Street

90. "Index to Letter Books, City Engineer's Office 1888 to 1900," Record Series 5600EN-25, Engineering Department, Letter Books-City Engineer, Volume 2. City of Savannah, Research Library and Municipal Archives.

91. *Annual Message to City Council of Hon. Wallace J. Pierpont, Mayor, … of the City of Savannah, Georgia, Year Ending December 31, 1916* (Savannah: Braid & Hutton Printers, [1917]), 309-10.

92. *Annual Message to City Council of Hon. Wallace J. Pierpont, Mayor,* 309.

93. Holley, 727. Holley quotes a report from a 1912 Municipal report in Cincinnati.

94. *Annual Message to City Council of Hon. Wallace J. Pierpont, Mayor,* 311.

95. *Annual Message to City Council of Hon. Wallace J. Pierpont, Mayor,* 308-09.

96. Tillson, 195, figure 11.