

Geometry and Genius Loci: Battista Antonelli's Fortifications in Havana

Olimpia Niglio

Published online: 7 August 2014
© Kim Williams Books, Turin 2014

Abstract In the wake of the conquest of the New World by the Spanish crown at the end of the fifteenth century, the expansionist interests of the other major European powers had become so invasive as to convince the Spanish King Philip II of the need to develop a systematic project for the military defense of the most important ports and coastal areas of his new overseas colonies. Italian military engineer Battista Antonelli was the first to apply the methods and procedures of Renaissance military architecture to the construction of Philip's fortifications in the New World. This paper analyses two important works of fortification that he designed and built in the city of Havana between the end of the sixteenth century and the beginning of the seventeenth: the Castillo de los Tres Reyes del Morro and the Castillo San Salvador de la Punta. Their completion not only introduced the European Renaissance culture of military architecture to the island, but also had a strong impact on the urban development of the city in general and its relationship with the surrounding territory.

Keywords Havana · Cuba · Military architecture · Renaissance · Fortifications · Battista Antonelli · UNESCO world heritage · Sixteenth century

Introduction

In the wake of the conquest of the New World by the Spanish crown at the end of the fifteenth century, the expansionist interests of the other major European powers had become so invasive as to convince the Spanish King Philip II of the need to

O. Niglio (✉)
Graduate School of Human and Environmental Studies, Kyoto University,
Yoshida Nihonmatsu-Sakyo-ku, Kyoto 606 8501, Japan
e-mail: olimpia.niglio@gmail.com

develop a systematic project for the military defence of the most important ports and coastal areas of his new overseas colonies. By then the Renaissance culture of field of military architecture was widely understood in all the major European courts, not least thanks to treatises published by Francesco di Giorgio Martini, Baldassarre Peruzzi, Giovan Battista Belluzzi, and Giuliano and Antonio da Sangallo, supported by important contributions from the liberal arts, mathematics, and geometry. Of the many interpreters of the Renaissance language of military architecture, the Italian military engineer Battista Antonelli, born in 1547 at Gatteo in the Duchy of Romagna and trained at the court of Vespasiano Gonzaga Colonna, Duke of Sabbioneta, was the first to apply its methods and procedures to the construction of Philip's fortifications in the New World. Although he was the architect of numerous fortified buildings, mainly in the Caribbean, few studies of military architecture have so far examined his work. This paper analyses two important works of fortification that he designed and built in the city of Havana between the end of the sixteenth century and the beginning of the seventeenth: the Castillo de los Tres Reyes del Morro and the Castillo San Salvador de la Punta. Their completion not only introduced the European Renaissance culture of military architecture to the island, but also had a strong impact on the urban development of the city in general and its relationship with the surrounding territory. In 1982, UNESCO added these fortifications to its World Heritage List, together with the historic centre of Havana.

Historical Context

Although it was the hope of the Italian admiral Christopher Columbus in 1492 to discover a route to the Indies, when he made landfall on 27th October it was in the vicinity of what is now called the Bay of Bariay, on the eastern coast of the island of Cuba in the present-day province of Holguín. His discovery of Cuba marked the beginning of a new era for the continent of America, whose thousands of years of history and rich cultural traditions now found themselves powerfully challenged by the politically-motivated drive of these new colonisers from overseas. Columbus made a second voyage in 1494 to explore the southern part of Cuba and took possession of the bay where Santiago de Cuba now stands, before continuing his voyage to the neighbouring island of Jamaica. Diego Velásquez was the first to explore the interior of Cuba, where he met with scant resistance from the indigenous population; in 1512 he established a first settlement that he named Baracoa (which is today a city in the province of Guantánamo), and it was here that the first fortified architecture in Cuba was built. In 1514 Velásquez went on to found the city of Santiago de Cuba, but it was not until 1519 that the city of San Cristóbal de La Habana was founded far away in the western part of the island (Fig. 1).

This Spanish colonisation of Cuba was only the beginning of a vast European expansion that began in the Caribbean and spread across the whole American continent. The construction of new ports in Cuba was facilitated by its wealth of natural harbours, and policies were adopted at an early stage to defend militarily the large natural bays at Santiago de Cuba and the capital at Havana, to prevent them from being captured by Spain's enemies: France, England, and the Netherlands.



Fig. 1 Havana's bay. On the *right* El Morro castle; on the entrance of the bay Real Fuerza castle. Photo: author

Weiss (1972), in *La Arquitectura Colonial Cubana* gives us a very detailed historical overview of the situation in Cuba in the wake of the Spanish conquest, and of why it became necessary to design and build the first fortifications.

When news arrived in Havana in April 1538 that French privateers were planning to attack the city and exterminate its inhabitants, it was decided to begin building fortifications. These became the first example of military architecture anywhere in Cuba, and only the second in the whole of the Caribbean (a first example having been built a few years before on the island of Hispaniola, today's Haiti and Santo Domingo).

The site chosen for Cuba's first defensive fortress at the capital, San Cristobal de La Habana, was halfway along the narrow channel leading into the harbour (and lying between the future sites of the fortresses of La Punta and the Castillo de la Real Fuerza, as will be discussed later). This was the first defensive building of any significance in Havana. Later given the name of Fuerza Vieja, it was designed in accordance with Renaissance principles of military architecture as these had been worked out in Europe, and which specified that structures erected to defend a city should be integrated with its urban fabric (Gonzalez Fernandez 1994: 227). From what we know of this first application of those principles in Cuba, the Fuerza Vieja was a citadel with a square plan measuring approximately 48 m on each side, had a tower about 10 m high on one corner, a full enclosure of defensive walls, and was armed with a battery of cannon. However very little other information about it is available, and it was demolished in 1582 because of very serious structural inadequacies; local histories record in fact that its method of construction consisted of *tapias con algunos pilares de cantería intercalados en la muralla* (adobe-like construction with some stonework pillars at intervals along the wall) (Weiss 1972: 31).

Havana's importance as a seaport lay in its role as a necessary port of call on the way to Mexico and the coasts of South America (Kagan and Marias 2000: 54). Following raids by French pirates in 1553 it was decided to equip the city with a more effective fortress, to be located very close to the Fuerza Vieja but more robustly built and with the ability not only to defend itself, but to launch counterattacks against any further incursions.

For this purpose, in 1556 Gerónimo Bustamante de Herrera, an engineer and expert on military construction, was engaged to build the new Castillo de la Real Fuerza. Due to illness he was later replaced first by Bartolomé Sánchez and then by Francisco de Calona, who took the works to completion. When the works got under way a significant event took place, recalled in an important transcription by Irene Aloha Wright from a document now kept in Seville at the Archivo General de

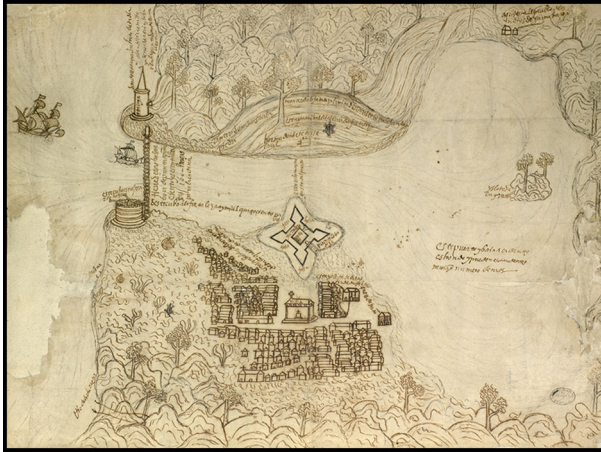


Fig. 2 Plan of Havana, in perspective, showing the Castillo del la Real Fuerza. Spain, Ministerio de Educación, Cultura y Deporte, Archivo General de Indias, Mapas y Planos, MP_SANTO_DOMINGO004R, Series geográficas 1596–1801, La Habana (Cuba). Reproduced by permission

Indias: the opening of the first stone quarry on Cuba, exclusively to supply material for building the fortress and the new mansions in the city (Aloha Wright 1930: 64).

In terms of defending the city of Havana, the site chosen for the Castillo de la Real Fuerza was less than ideal; it was small, had no parade ground, and was located very close to the inhabited part of the city at a considerable distance inland from the harbour mouth (Fig. 2). It consisted of a central nucleus measuring about 30 m square and had walls up to 6 m thick and 10 m high and four polygonal bastions with vaulted roofs, one at each corner (Weiss 1972: 35). Its geometrical dimensions were harmonically organised to closely approximate a four-leafed cloverleaf in plan: the first significant application in the Caribbean of the principles of fortified architecture that had been developed in Europe during the Renaissance and indeed, in a typology that was very similar to that of some fortresses in Italy, as at L'Aquila and Barletta. But as it turned out, the Real Fuerza was never used for any specifically military function; it served instead as the headquarters for the Spanish Governors, and the alterations made at a later date, such as a panoramic viewing tower built by the Governor Juan Bitrián de Viamonte between 1630 and 1634 on top of the north-western bastion, were in fact intended to reconfigure it as a palace rather than a fortress (Weiss 1972: 36). Today the Castillo de la Real Fuerza is open to the public as a museum (Figs. 3, 4).

Battista Antonelli and the Fortifications of Havana at the End of the Sixteenth Century

It was not until the end of the sixteenth century that Spain was able to formulate a comprehensive project for the military defence of the city of Havana. In fact, as soon as the Spanish crown had taken possession of its lands in the Americas it



Fig. 3 Havana. Castillo de la Real Fuerza. The main bastion to the East. Photo: author



Fig. 4 Havana. Castillo de la Real Fuerza. The main bastion to the West. Photo: author

became evident that there was a need to develop a comprehensive plan for the defence of the whole Caribbean area: an arduous task that Philip II of Spain decided to entrust to Battista Antonelli in February 1586 (Llaguno y Amírola et al. 1829).

Battista Antonelli was an Italian engineer and an expert in military fortifications.¹ He had been trained at the court of Vespasiano Gonzaga Colonna, the inventor and the first (and only) Duke of the ‘ideal city’ of Sabbioneta, situated between Mantua and Parma, which he designed himself after taking lessons in urban and

¹ Very few publications deal with the activities of the military engineer Battista Antonelli. At present the most important scholarly reference is the very reliable 4-volume work by Eugenio Llaguno y Amírola et al. (1829), especially vol. 3, pp. 1570ff., where the authors specifically discuss the military engineer Battista Antonelli, designer of fortifications in Puerto Rico; Santo Domingo; San Juan de Ulúa in Mexico; Portobelo on the Chagres River in the vicinity of Panama; at Cartagena in Colombia; and in Cuba at Havana and Santiago de Cuba. For more recent discussions, see Maggiorotti (1939) and Sartor (2004).

architectural design at the schools of Giuliano and Antonio da Sangallo and Michele Sanmicheli. As a young man in the service of the Gonzaga Colonna family, Battista Antonelli had the good fortune to be part of this cultured milieu, where he received training in military architecture and acquired sound knowledge of the new Renaissance treatises that dealt with this subject. It is not unlikely, moreover, that this was where he was taught mathematics and began to develop the personal interpretations that formed the basis for his later, more important activities. As in fact we shall see, it is clear in his own plans for fortifications that knowledge of mathematics and geometry played an important part in his projects for military architecture in the New World.

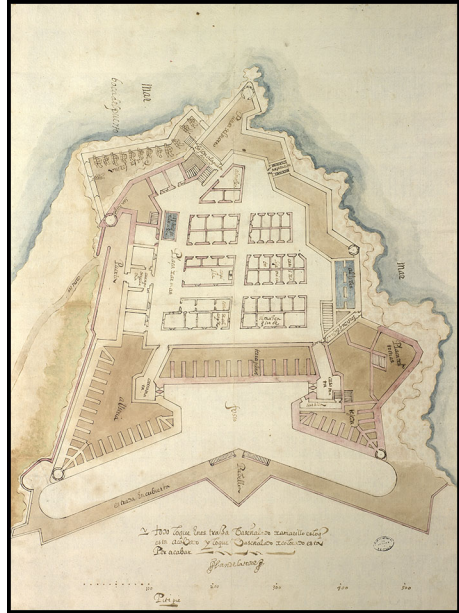
Even though at present no information has been found about works of his in Europe (other than collaborative work with others) it is known that his activities in the service of the Spanish Crown, building military architecture for the defence of coastal areas and ports, particularly in the Caribbean, was intensive. But these Caribbean activities did not begin immediately. A first adventurous voyage in 1581 took him along the coasts of Brazil and Chile; a second trip in 1586 took him to Cartagena de Indias in Colombia, on to Panama, and finally to Cuba, where he arrived for the first time on 12 July 1587. But it was not until his third voyage to the Caribbean, in 1589, that he went back to Havana to begin work on his two most important fortification projects: the Castillo de los Tres Reyes del Morro and the Castillo San Salvador de la Punta.

As mentioned, the existing fort, Castillo de la Real Fuerza, did not enjoy a particularly strategic position. A thorough review of the whole defensive system led to the decision to build a new fortress with a much more strongly territorial aspect. Before designing it, Battista Antonelli studied the topography and then worked out a plan for the defence of Havana at a territorial scale, identifying two sites, one on each side of the mouth of the entrance to the bay of Havana, where he built the Castillo del Morro and the Castillo San Salvador de la Punta.

The site for the Castillo del Morro was on high ground dominating the north-eastern side of the entrance to the bay: a magnificent location that later became the inspiration for many local artists and scholars; thanks to its strategic position as a great fortress dominating the harbour mouth, it came to be adopted as the symbolic building of the Republic of Cuba (Roig de Leuchsenring 1957–60: 32). In plan, the Castillo del Morro is an irregular polygon with three large bastions whose forms and dimensions are carefully made to harmonise with the shapes of the rocky surfaces on which they stand (Fig. 5). This generated various irregularities in Battista's plan that were a product of his previous experience and his interpretation of military architecture as he had acquired knowledge of it during his training in Italy, where similar irregularities are seen typically in the work of Antonio da Sangallo, for instance in his fortifications at Pisa (Niglio 2007: 419).

The irregularity of Battista's plan for the Castillo del Morro was also due to the need to adapt the building to its site. This adaptability was in fact a fundamental aspect of Battista Antonelli's approach to designing fortifications, which was based on acquiring comprehensive understanding of the contours of a site where they were to be built, and often incorporated the surrounding territory into the defensive arrangements. The Castillo del Morro is a case in point: built high on a rock that

Fig. 5 Plan of the Castillo del Morro. Spain, Ministerio de Educación, Cultura y Deporte, Archivo General de Indias, Mapas y Planos, MP-SANTO_DOMINGO27, Series geográficas 1596–1801, La Habana (Cuba). Reproduced by permission



risers some 40 *varas* (33.43 m) out of the water (in the Castillian dimensioning system 1 *vara* was equal to 0.8359 m) (Acosta and Félix 1964: 43), it included a tower 12 *varas* high (10.03 m) on the outermost bastion, from which arriving vessels could be kept under observation (in 1844 this was replaced by the present-day round tower, 30 m high and 5 m in diameter) (Weiss 1972: 42) (Figs. 6, 7).

The three bastions girded a central area measuring about 13 *varas* (10.86 m) on each side that originally contained buildings for use as workshops, dwellings, and the other activities connected with operating the fortress. It was defended by two batteries of cannons facing the ocean, of which the more important was positioned very near the central part of the complex and was called *Los Doce Apóstoles* because of its 12 guns. The second battery, denominated *La Pastora* (Gonzalez Fernandez 1994: 17) was about 500 *varas* (417.95 m) away in a more southerly part, and had an armament of 12 cannons.

The irregular plan of the Castillo del Morro emphasises Battista Antonelli's decisive intention to make it establish a dialogue with the surrounding territory, in a configuration which, apart from a few isolated elements and dimensional considerations of technical type, does not in fact comply with the laws and regulations imposed by Spanish culture of the time. But this has no deleterious effect on its architectural integrity; in fact in the Caribbean territories where the Spanish needed to build fortifications, the terrain was unlike that in Europe and when new fortresses had to be designed, none of the preconceived geometric models were ever adhered to (Blanes 1998: 47). What is interesting to note in Battista Antonelli's Castillo del Morro is that in its unusual profiles, in the significant heights of its parts, the proportions of its ramparts, and in the precision with which he worked out the corner solutions, he was searching for a geometry that did not



Fig. 6 Castillo de los Tres Reyes del Morro, the eastern walls. Photo: author

Fig. 7 Castillo de los Tres Reyes del Morro, the main bastion to the east. Photo: author



necessarily aspire to symmetry. In fact, and as recent studies of the geometry of the Castillo del Morro show (Sánchez Gómez Julio 2010: 191), no reference can be found to any of the principles of symmetry that were usually followed in Europe for the design of military architecture. In Havana, the only symmetry in the Castillo del Morro is in the lines Battista Antonelli used to generate the fronts of the two bastions. In terms of pure military defence, the dimensional aspects of his project overall are in fact determined by models that respect the technical rules and are based primarily on strategic considerations, such as the correct inclination of the cannons and their required line of fire; but even though these considerations were respected, the unevenness of the terrain meant it was not possible to apply the geometric rigour envisaged in the Renaissance treatises. For all that, Battista Antonelli's Castillo del Morro exhibits a perfection and harmony that powerfully

express the classical architecture culture of the Renaissance as it was introduced to Cuba by him, in an interpretation that suited the local situation. For that reason, Cuban historians consider the Castillo del Morro to be the primary example of a technically, geometrically rigorous fortress of the late sixteenth century (Blanes and Herrera 1982: 22) and even though the building subsequently went through many changes that included partial demolitions and additions, particularly after 1792 when it was occupied by the British, the design as it had been finalised by Battista Antonelli remains perfectly readable today in all its parts.

Thus it is clear that the interaction between a building, its site, and its geometries was a very significant aspect of the fortifications built by Battista Antonelli in Latin America, particularly in Havana. It is important for us to know what his sources were for these geometries, how he developed them, and how he consolidated them to make his fortresses act as integral parts of a specific territory. Writing about the Castillo del Morro, the architect and historian Roberto Segre has noted how its geometries dramatise the irregular shape of the terrain and integrate themselves with the rocky promontory at the harbour entrance, stepping down to the sea via a cascading sequence of terraces. Segre also observes how in establishing a close relationship with its site, the Castillo del Morro brings into sharp contrast the strength of Nature (the large, rocky promontory) and Man (the frailty of the timber used by Man to build ships) (Segre 2001: 290) throwing down a real challenge in which one of the tasks of this architecture of fortification is to integrate both by bringing into play a powerful ability to abstract its own geometries out of the rationalism of Renaissance theories (Segre 1972: 42).

Battista Antonelli's project for the Castillo San Salvador de la Punta, the second most important late-sixteenth-century fortress in Cuba, was to be the completion of his strategic plan for the military defence of the north-western entrance of the bay of Havana. Begun almost contemporaneously with El Morro and facing it across the harbour mouth, its much flatter site would have made possible a more regular configuration, closer to the arrangements set out in the Renaissance treatises (Fig. 8).

However, once again it exhibits the same geometric irregularity, although of course it still complies with the requirements of a military strategy intended to have an offensive as well as a defensive function. But whilst the Castillo San Salvador de



Fig. 8 Havana, Castillo San Salvador de la Punta, overview. Photo: author

la Punta was under construction, in August 1595 a powerful hurricane destroyed some of its above-ground parts, and as a result it was decided to scale the building down from a fortress to a simple tower that could be used as the platform for a battery of guns (Weiss 1972: 41). It was not until the early seventeenth century in recognition of the strategic role of its site, not least in relation to the Castillo del Morro, completed in all its magnificence about 30 years before on the foreland opposite, that a decision was taken to complete it (Cuevas Toraya 2001: 11). The strategic importance of doing so was not only because of the Castillo San Salvador de la Punta's position on the coastline, but also its situation near the mouth of the Almendares River. In plan it is an irregular polyhedron of some considerable size (measuring about 100×50 m) with a profile that still makes use of the geometric principles seen in Battista Antonelli's other projects for military architecture (Guardia Hernández 1994: 20) (Figs. 9, 10). The deep moat that originally surrounded it was channelled straight out of the rock, and the channels that supplied it with potable water were also used to supply the city and the ships in the harbour.



Fig. 9 Havana. Castillo San Salvador de la Punta. Photo: author



Fig. 10 Havana. Castillo San Salvador de la Punta. Photo: author

The Geometric Peculiarities of Battista Antonelli's Fortifications in Havana

As a result of Battista Antonelli's systematic plan for the fortification of Havana, by the beginning of the seventeenth century the city was able to benefit from no less than three important defensive fortresses: the Castillo de la Real Fuerza, the Castillo de los Tres Reyes del Morro, and the Castillo San Salvador de la Punta. This made Havana the largest fortified harbour in the Caribbean, which Philip II then officially designated "the Key to the New World and Rampart of the West Indies". In the ensuing centuries these three fortresses became symbols of the island of Cuba itself, a source of inspiration for artists and writers who celebrated them in numerous paintings and literary works.

Although Battista Antonelli's two projects for the Castillo de los Tres Reyes del Morro and the Castillo San Salvador de la Punta possess specific characteristics from which no generalisations should be extrapolated, they can nevertheless be analysed to identify some principles that characterise his contribution to the field of military architecture.

One is the *scientific* nature of his design approach. In each situation he combines his empirical knowledge with a clearly technical/scientific method that enables him to resolve problems case by case during the design and construction process. This connects to his *organic* approach to the *genius loci*, according to which a defensive structure can only impose its military rules insofar as it is prepared to harmonise with its location and with the specific topography of its site: a dialogue that is very clear to see in the Castillo de los Tres Reyes del Morro, where the promontory becomes an active component of the defensive structure and where the upward stepping of the terraces, and the arrangement of the ramparts to integrate them perfectly with the terrain, even make Battista Antonelli's architecture seem to hark back to European Renaissance fortifications.

As we have seen, he was very well acquainted with Renaissance treatises on military architecture and his projects are re-workings of the lessons he learned from them; but whereas the treatises gave predominance to symmetry, and envisaged that plans would take the form of closed polygons, he adopted an *open compositional structure* and assembled polygons that still fully addressed the military requirements but were irregular and multidirectional. Thanks to these particular aspects, Battista Antonelli's architecture generates its own *dynamic defensive form* that clearly distinguishes the bastions (as attack elements in the operation of the fortress) from the perimeter walls (as passive obstacles whose purpose is to repel assaults): a dynamic interpretation of military architecture that is one of the strengths of his approach, in which each element establishes its own close relationship with the territory, and the fortress as a whole takes on a configuration that is urban.

Critical Assessments of the Work of Battista Antonelli

Historiographic interpretations have often confused Battista Antonelli (Gatteo, 1547–Madrid, 1616) with the name of his elder brother Giovanni Battista Antonelli (Gatteo, 1527–Toledo, 1588), or with Battista's own son Gian Battista (Madrid,

1585 – Cartagena de Indias, Colombia, 1649). Despite this confusion about names and the lack of critical acclaim accorded to his work, the copious amounts of material in the Archivo General de Indias in Seville constitutes an inexhaustible, indispensable resource that compensates for the lack of attention this architect has so far been given in studies of Renaissance military architecture. Although his work has not yet been studied in any detail, sufficient documentation is available for thorough research to be carried out into his fortified architecture in Latin America, mainly in the area of the Caribbean, and for analyses of it to be made. This paper seeks to introduce and explain these fortresses as an architecture of prestige that operates at the grand scale, not only in terms of its aesthetics but also technically.

Battista Antonelli's late-sixteenth-century fortifications in Havana demonstrate his ability to range from questions of artistic and architectural style to every aspect of engineering, even the science of hydraulics. This was why he was held in high regard as a military engineer and technician by his patrons, most notably Philip II, who saw in his ideas and skills the opportunity to implement audacious projects for fortification. These remain today as evidence of a colonial culture whose magnificence continues to impress. Even though Battista Antonelli was indeed skilled in engineering and construction, he should above all be seen as the first and most important interpreter of the Renaissance language of military architecture in the New World. Of all the great military architects who came before him—Michelozzo Michelozzi, Giovanni Battista Belluzzi, Giuliano and Antonio da Sangallo—it was he who transmigrated Renaissance taste abroad, firstly and foremostly to the Caribbean.

References

- Aloha Wright, Irene. 1930. *Historia documentada de San Cristóbal de La Habana durante la primera mitad del siglo XVII*. La Habana: Academia de la Historia.
- Blanes, Tamara. 1998. *Castillo de los Tres Reyes del Morro de La Habana*. La Habana: Ed. Letras Cubanas.
- Blanes, Tamara, and José A. Herrera. 1982. *Fortificaciones Coloniales de la Ciudad de La Habana*. Dirección de Patrimonio Cultural: La Habana.
- Acosta, De Arrate, and José Martín Félix. 1964. *Llave del Nuevo Mundo*. Comisión Nacional Cubana de la UNESCO: Antemural de las Indias Occidentales. L'Avana. La Habana.
- Juan, de la Cuevas Toraya. 2001. *500 años de construcciones en Cuba*. La Habana: Chavín S.L.
- de la Guardia Hernández Miguel. 1994. *Fortalezas, mansiones e iglesias de La Habana colonial*. La Habana: Publicigraf.
- Gonzalez Fernandez, Alfredo. 1994. Repercusiones especiales de la fortificación colonial en La Habana. *Eria* 35: 225–240.
- Kagan, Richard, and Fernando Marias. 2000. *Urban Images of the Hispanic World, 1493-1793*. Yale: Yale University.
- Llaguno y Amírola, Eugenio and Ceán Bermudez, Juan Agustín. 1829. *Noticias de los Arquitectos y Arquitectura de España desde su restauración*. Madrid: Imprenta Real.
- Maggiorotti, Leone Andrea. 1939. L'opera del genio italiano all'estero. In *Volume terzo*, ed. Architetti Militari. Roma: Istituto Poligrafico dello Stato.
- Niglio, Olimpia. 2007. Tesori militari ed ipotesi di trasformazione nel nuovo assetto urbano della città di Pisa. *Difese, costruite, amministrate*, 417–430. *Le città e i militari in età contemporanea*: Università di Roma Tre.

- Roig de Leuchsenring, Emilio. 1957-60. *Los monumentos nacionales de la República de Cuba*. vol. III, Fortalezas coloniales. La Habana: Publicaciones de la Junta Nacional de Arqueología y Etnología.
- Sánchez Gómez Julio, Santos Pérez José Manuel. 2010. *De Urbe Indiana. Ensayos sobre ciudades y urbanismo en Brazil y en la América Hispanica*. Salamanca: Ediciones Universidad de Salamanca.
- Sartor, Mario. 2004. *Omaggio agli Antonelli*. Udine: Forum Editrice Universitaria Udinese.
- Segre, Roberto. 1972. *Significación de Cuba en la evolución tipológica de las fortificaciones coloniales de América*, *Boletín del Centro de Investigaciones Históricas y Estéticas* 13, 9–57. Caracas: Universidad Nacional, Facultad de Arquitectura.
- Segre, Roberto. 2001. Geografía y geometría de América Latina: naturaleza, arquitectura y sociedad. *Ciudad y territorio: Estudios territoriales* 128: 283–296.
- Weiss, Joaquín E. 1972. *La arquitectura colonial cubana*. La Habana: Letras cubanas.

Olimpia Niglio is Full Professor in the Programme of Architecture at University of Bogotá Jorge Tadeo Lozano in Colombia. She received her PhD from University of Naples (Italia) on the topic of the innovation technologies for the architectural restoration. She is the author of the books on the history of architecture and on the architectural restoration. In 2012 she was awarded a Visiting Professor Fellowship at Kyoto University in Japan where she continues your studies on the architectural dialogue between East and West.