

ACQUA VIVA E CORRENTE: INSIGHTS FROM RENAISSANCE FONTANIERI MASTERY

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In a moment when climate, social, and racial activism has entered architectural criticism and theory with full force (see the theme of the 18th International Architecture Exhibition, La Biennale di Venezia: The Laboratory of the Future), to pause and look back at Renaissance Garden villas seems counterintuitive. From today's perspective, the Renaissance brings up ideas of an idealized nature that are too antiquated to look at when analyzing the emerging questions regarding the design profession. Perhaps this is true if considering habits of judgment that rely on notions that oppose human and nonhuman concepts of nature, or ideas of nature vs. technology. However, when we acknowledge the lack of clear boundaries between what we define as landscape and technology, and human and nonhuman (Lee and Helphand 2014), landscape as a field of study emerges as an array of complex systems that can be observed from different lenses.

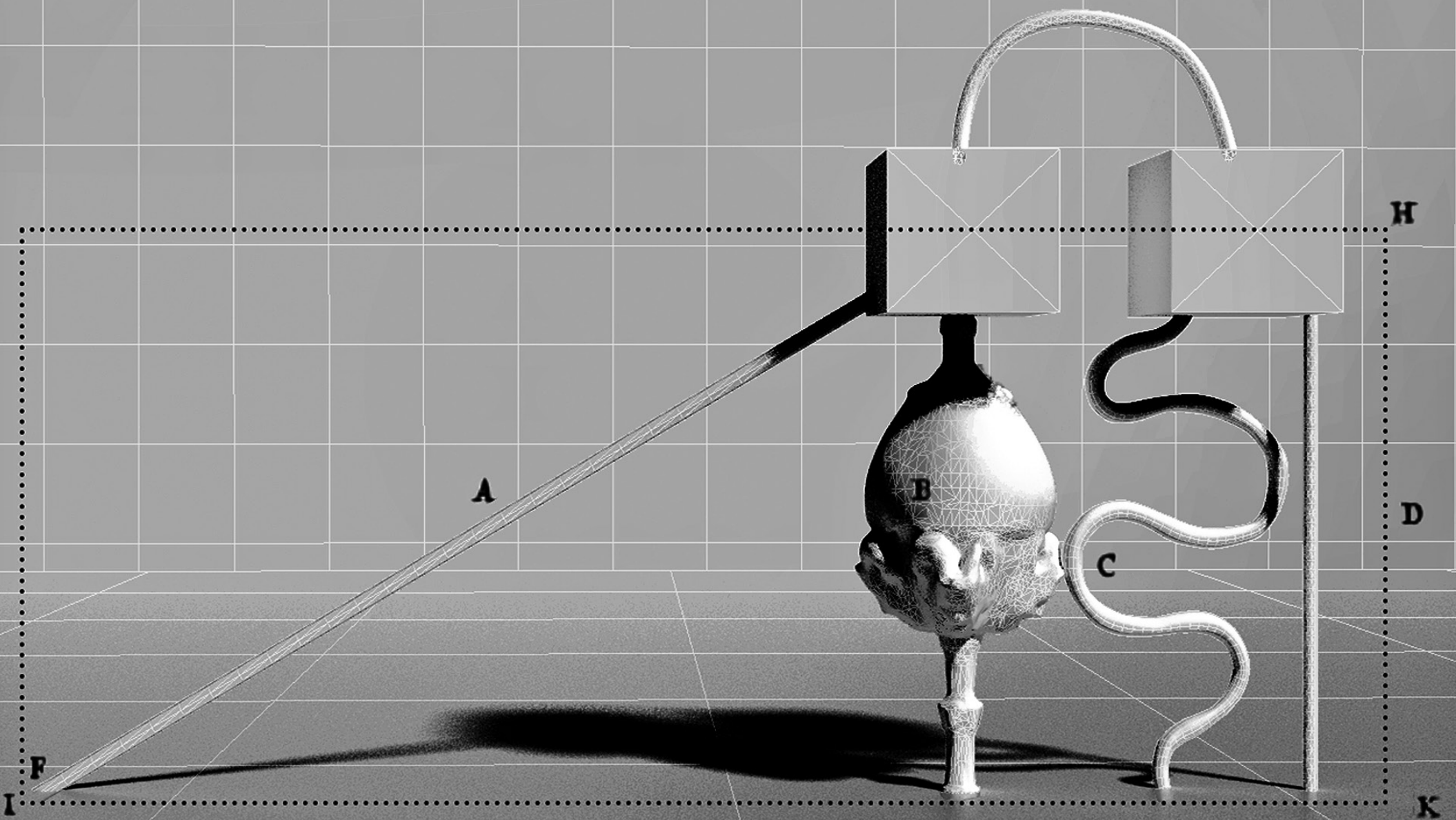
Today, professionals and scholars largely struggle to predict, account for, or respond to climate impacts in contemporary design projects, despite the many computational tools and techniques at their disposal. This shortcoming urgently calls for an experimental approach to both design research and design practice. As such, there is a growing number of scholars interested in defining “Designed Experiments” (Felson and Pickett 2005) and “Research Through Design” (RTD) methods and techniques, given these concepts’ potential for innovation in the field and to respond to pressing issues such as climate change. Surprisingly, during the Renaissance, the *fontanieri*, the professionals who oversaw fountains’ design and hydraulic marvels, found themselves in a similar position. As Katherine Rinne (2011) and Rafaella Fabiani Gianetto (2008) noted, the *fontanieri* had to rely heavily upon onsite experimentation rather than precise calculations. Rinne points out that although there is a consensus among scholars that theoretical inquiry in classical texts and hydraulic treatises from this period had an impact on fountain and garden design, it is often overlooked the fact that the design practice performed by these architect-engineers also influenced and helped move forward hydraulic science and engineering.

It is striking to note how little attention the field of garden and landscape history has devoted to the incredible mechanisms and techniques that were employed to move water, even though water was considered the very soul (the *anima*) of these gardens and devices. When perceiving such bodies, the physical properties overshadow the inner works.

Terrariums, for example, present a useful metaphor, because they are, at the same time, ecosystems filled with bloom-

Water storage and movement. Image elaborated by Hermano Luz Rodrigues.
Collage of images found in *Utilissimo trattato dell'acque correnti*, Fontana,
Carlo, Roma, 1696. Source: ETH-Bibliothek Zürich, Rar 1070.

Fig. 1.



ing natural life and man-made inert environments. What attracts many people's attention often relates to their visible physical features: their mesmerizing and diorama-like appearance, a beautiful microcosmos of natural elements. Despite not giving the attention it deserves, the fascinating designs of both the terrarium and the garden villas were anchored by the control of water in a man-made system, the latter usually put underground and out-of-sight. Both are also evocative of the concept of a controlled nature, or a third nature as John Dixon Hunt refers to the garden villas: pleasant aesthetic landscapes (Hunt 2000, p. 34).

The control and transport of water are among the oldest challenges in human history, intrinsic to evolving notions of nature and its representation over centuries (Antoine Picon 2015). Even today, our relationship with water is not optimal, mainly because of the indiscernibility of water in everyday tasks: clean water comes out of the tap, or up in a fountain, after being transported and cleaned and transported again over kilometers of invisible underground pipes (Illich 1986; Graham 2009). Such is the nature of urban infrastructure that is conceived to mingle seamlessly in space to become invisible, as Graham and Thrift argue in "Out of Order: Understanding Repair and Maintenance" (2007). Antoine Picon re-states that the water crisis we find ourselves in today, be it scarcity or excess, is primarily political and technological (Margolis & Chaouin 2015).

The political roots of the problem have been explored extensively in the works of Matthew Gandy, Eryk Swyngedouw, Maria Kaika, and Bruno Latour (Gandy 2006). Nonetheless, the technological historical thread is also broad: water can be placed in the center of urban technological innovation from the first Roman aqueducts to the 18th-century Industrial Revolution in Europe (Fischer et al. 2016). Until the mid-18th century, engineering was often presented as a discipline mostly focused on hydraulic problems; in fact, it was commonly known as "hydraulic architecture." *Architecture Hydraulique* is also the title of the 18th century's most crucial engineering treatise, by Bélidor, concerned with conveying, distributing, and managing water. In this long historical thread, a forgotten figure, the *fontanieri*, in Italian, or *fontainiers* in French (Santini 2019), central to the creation of the sixteenth-century Italian garden can shed light on current discussions about the idea of nature and technology in design (Gissen 2019).

These individuals had several interdisciplinary skills, usually being artisans, plumbers, hydraulic engineers, and architects. Although the first *fontanieri* were not acknowledged, some

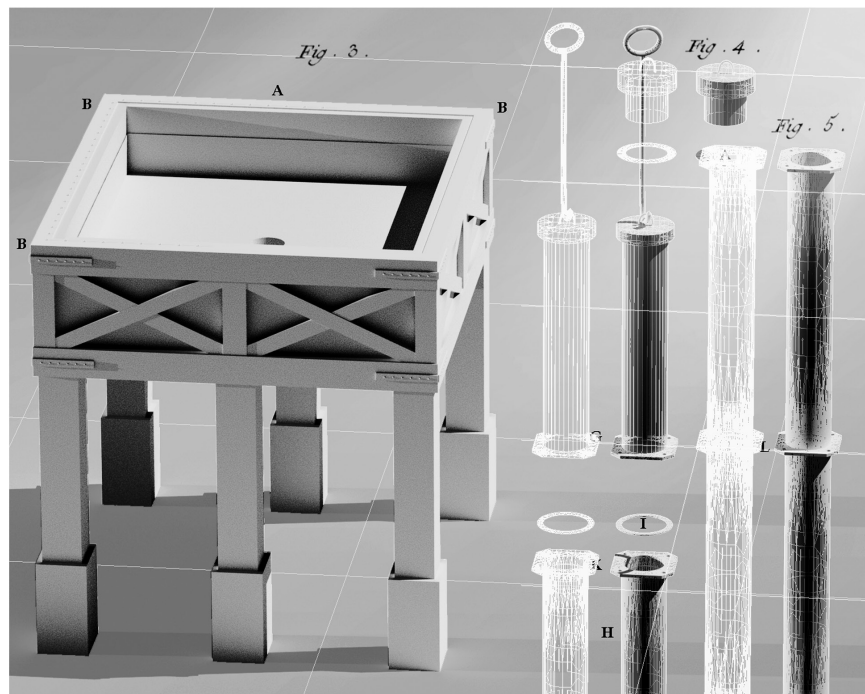
Another way to augment the strength of a fountain using solar energy.

Image elaborated by Hermano Luz Rodrigues. Collage of images found in Book One, Problem XV, *Les raisons des forces mouvantes* by Solomon de Caus, Frankfurt 1615. Source: Smithsonian Libraries and Archives, Natural History Building.



Cistern design to store water and provide water pressure to public fountain and details of cistern pillars.

Image elaborated by Hermano Luz Rodrigues. Collage of images found in Etching from *L'Art du plombier et fontainier* attributed to Claude Matthieu Delagardette, Paris 1773. Source: National Library of France, Rare Books Reserve department, V-3974.



achieved recognition such as Curzio Maccarone, known for completing notable masterpieces at Pirro Ligorio's Villa d'Este (1550-1572): the Tivoli Fountain, and the Fountain of Rome, or Rometta (Symmes, Breisch, and Astley 1998, p.139). Luc Le Clerc and Claude Venard were also known specialists in water automata, known for Villa d'Este's Water Organ (Barbieri 2020).

The fifteenth-century discovery of ancient texts, mainly Vitruvius' manuscript in 1408, led to a renewal of artistic and technological interest in fountain construction (Coffin 1991, p. 50-53), prompting a new stake in hydraulics. One century later, the restoration of ancient water networks and the new influence of popes and powerful families led to a revival in the construction of water devices, such as in Villa d'Este. Bernardo Buontalenti, well versed in humanistic topics, masterminded new water jets and automata for the Medici Villa (1569-1589) in Pratolino, near Florence, combining knowledge from classical texts and new construction technologies (Fabiani Giannetto 2008). Hydraulic expertise then migrated to France from Italy in 1598, when Tommaso and Alessandro Francini, who had worked with Buontalenti on Pratolino, were summoned by Henri IV and his wife Marie de Medici to design a great Italianate Garden for the Chateau of St. Germain-en-Laye (Coffin 1991, p. 54).

The commission of talented *fontanieri* in foreign territories certainly popularized these new inventions. Still, the primary means of transmitting practical hydraulic information throughout Europe was via published treatises and illustrated books, contributing to the evolution of scientific technology. Buontalenti's Norman apprentice Salomon de Caus (1576-1626) became an internationally renowned pioneer in hydraulics. de Caus published the "Principles of Moving Forces" in 1615, a fundamental text on hydraulic mechanics and garden engineering that influenced future *fontanieri* (Strong 1979, p. 73-79).

The Italian architect and engineer Carlo Fontana (1638-1714), who worked with Bernini redesigning the plaza in front of St. Peter's, and who designed the fountain pool for Rome's Fontanone for the Acqua Paola in 1690, also published an important treatise on hydraulics. Fontana's *Utilissimo trattato dell'acque correnti* (The Most Useful Treatise on Moving Waters), 1696, was based on an ancient text about Roman aqueducts by Frontinus. It also incorporated explanations of the most recent scientific discoveries. Fontana's text on aqueducts underscores that pipes are an essential component of the hardware that makes fountains work.

Likewise, the late eighteenth-century French book, *L'Art du plombier et fontainier* (The Art of Working in Lead and Foun-

tain Making), 1773, attributed to Claude Mathieu Delagardette, is an informative guide to forging lead, as well as to making pipes, joints, drains, gutters, cisterns, reservoirs, and other fountain fixtures. The book also notably covered the installation methods necessary for utilitarian and ornamental fountains.

Drawings that illustrate underground pipes and mechanics, like the ones by de Caus, Fontana, and Delagardette, are rare to find in contemporary landscape design books. Systems such as reservoirs and underground pipes are essential components of these projects, therefore should be presented as notable contributions and brought to the fore. Nowadays, like in the project of the Renaissance Garden villas, teams of hydraulic engineers and experts work together with architects and artists to conceptualize modern fountain waterworks, that are true artworks but later rendered invisible literally and figuratively because these covert infrastructures and their development are never seen or shown to the public. The figures responsible for designing these systems, the architect engineers, and the hydraulic experts behind these projects, remain largely hidden figures. In some ways, they bear similarities with Renaissance *fontanieri*. According to Stephen Graham, quoting Bernward Joerges, to become infrastructure, certain technology must become invisible, or at least culturally invisible in a process called “technology black boxing”. Unboxing these mechanics and knowledge, however, even in experimental ways, may open or illustrate pathways to innovative thinking and further understanding in the contemporary design discipline.

The ‘Starchitect’ figure can be seen as a consequence of this black-boxing system, in which the hierarchies and lack of accreditation in productions end up venerating a single figure or type of profession. This has incited many students and prospective professionals to aspire to be in that specific role. Regarding design itself, in the twentieth century, the field of fountain hydraulics expertise has also incorporated digital and computer processing technologies combined with the traditional methods dating back from de Caus, Bèlidor and Fontana (Symmes, Breisch, and Astley 1998, p. 25) opening possibilities for innovative design conceptualizations but also new opportunities to incorporate fountains in public spaces as big as the 3,450 sqm Bordeaux’s water mirror to Olafur Elyasson’s fog rings.

Digital technology and the creative use of materials and mediums can help envision and make visible the complexities behind such systems and give them new meaning in a time of several environmental crises.

Acknowledging the unsung heroes and the necessity of their work can mitigate such pervasive issues in contemporary architecture and design culture and promote a more balanced professional ecosystem.