# Parametric Architecture: the American Visions of Vittorio Giorgini

Alessandro Meloni, Denise Ulivieri, Marco Giorgio Bevilacqua, Piergiuseppe Rechichi, Zhangliang Shuai

*Abstract*

*This paper analyses the American work of Vittorio Giorgini (1926-2010), a Florentine architect who, starting in 1969, found in New York the ideal context for developing visionary and experimental research. The study focuses on the projects* Walking Tall *(1982-1983) and* Hydropolis *(1981-1982), emblematic examples of an architectural language that combines geometric rigor, structural experimentation, and strong expressive intensity. In these works, geometry acts as the generative principle governing form, structure and function, anticipating approaches that can today be associated with parametric thinking. Through the analysis of archival drawings and manuscripts, the research identified the elementary geometric units and the aggregation logics underlying the projects, translating them into dynamic digital models through VPL (Visual Programming Language) procedural modelling tools. This method made it possible to validate the consistency of Giorgini's design grammar, confirming its relevance and translatability into flexible generative systems. The digital reconstruction does not operate as a mere reproduction, but as a testing environment capable of verifying the feasibility of the proposals, transforming utopian vision into operative hypothesis. The paper thus highlights the anticipatory value of Giorgini's research, a still under-recognized figure who combined geometric experimentation, attention to the urban context, and the aspiration towards alternative models of the city, and who can today be considered among the forerunners of parametric architecture.*

*Keywords: Vittorio Giorgini, archival drawings, procedural modelling, Visual Programming Language, geometry.*

## Introduction

This paper examines the work of architect Vittorio Giorgini (1926-2010) during his American period, with the aim of shedding light on innovative and forward-looking projects that still remain under-acknowledged today. Giorgini spent the first part of his life in Florence, but from 1969 onward he found in the United States the most fertile ground for his research and design work. Building on existing studies [1], it is now possible to start a research focused on Giorgini's American architectural production, consisting largely of unbuilt projects preserved in archives [2], which reveal a strong expressive and constructive originality. His proposals combine a provocative, unconventional language with a rigorous geometric structure based on principles of proportionality and fundamental geometric operations, an approach rooted in architectural culture which, although conceived in a pre-digital context, anticipates methodological principles now associated with parametric design.

The aim is to enhance this heritage through virtual modelling, grounded in the analysis of sources and theoretical principles. The study of archival material makes it possible to investigate Giorgini's design methods and the theories underlying his architectural forms, in which structure determines the overall expressive character and emerges as the outcome of a sophisticated geometric system, even though not always explicit. The digital reconstruction is

based on the interpretation of these geometries through parametric strategies designed to generate dynamic, implementable, and constantly evolving structures. The use of VPL (Visual Programming Language) tools enables the investigation of constructive principles and confirms the contemporary relevance of Giorgini's research.
The paper therefore represents an opportunity to rediscover a remarkably significant designer who, although not completely understood by his contemporaries, appears today as a precursor of approaches central to contemporary architecture. The New York projects *Walking Tall* (1982-1983) and *Hydropolis* (1981-1982) embody the essence of his American experience: works with strong expressive charge and dynamic forms, situated on the boundary between architecture and art. In these projects, the design process fuses architecture, engineering, and the visual arts, generating a language that assumes sculptural qualities transposed into architectural form.

## Giorgini: a florentine architect in New York

Vittorio Giorgini was born in Florence and grew up in a culturally and socially stimulating environment. At Villa Torrigiani his father Giovan Battista (1898-1971), a key promoter of Made in Italy worldwide, organized in 1951 the first Italian high-fashion event for the major American department stores market [Fadigati 2023]. At that time, Vittorio was twenty-five years old, actively assisting his father while studying at the Faculty of Architecture in Florence. From his university years onwards, his research focused on the 'question of the model in nature' and its application to architecture, not as literal imitation, but as a means to achieve more efficient and effective complex systems. His explorations ranged from the study of curved systems such as shells and membranes to an interest in tensile structures, and to the geometric analysis of tetrahedral and octahedral forms.
Following this intense research, Giorgini coined the term 'Spatiology' to define his morphological studies in which he investigated the ways, the economies, the workings, and thus the relationships between forms and static systems of resistance, the constitution of matter and its functions [Giorgini 1995; Giorgini 2006].
After graduating in 1957, he combined professional and academic work, collaborating with Leonardo Savioli (1917-1982) and Giuseppe Gori (1906-1969), and developing a strong intellectual bond with Giovanni Michelucci (1891-1990). To this period belong his two iconic architectures – Casa Esagono (1959) and Casa Saldarini (1962)– both built in the Gulf of Baratti, only a few metres apart, where he had the opportunity to apply principles derived from the morphology of natural sciences to architectural design [3].
Growing disappointment within the faculty and bitter professional dissatisfaction at the failure to complete many projects prompted him to emigrate to New York in 1969, where he became a professor of design at the Pratt Institute School of Architecture. He fully immersed himself in the artistic and cultural life of what Koolhaas called the capital of 'permanent Surrealism' [Koolhaas 1978], building relationships with architects, artists, and intellectuals including Isamu Noguchi (1904-1988), Priscilla Morgan (1920-2014), Buckminster Fuller (1895-1983), John Maclane Johansen (1916-2012) and Robert Rauschenberg (1925-2008) [4].
His American projects are paradigmatic of his lifelong research. From the mid-70s onwards, Giorgini adopted construction systems based on triangular geometric configurations, linked to tetrahedral and octahedral space-frame logics, offering superior structural, formal, functional, and technological performance. He realised, in fact, that "in the study of nature […] ultimately, systems, even those that did not seem so –were based on triangular geometries" [Giorgini 2006]. Although fully aware of the transition from the age of mass media to that of computers, his structural and organic research led to proposals that were largely left unbuilt, often misunderstood, and labelled by critics as informal or excessive. His projects were grounded in a radical trust in technology –still too expensive and not yet standardised at the time [Ulivieri et al. 2022b; Ulivieri 2025]. They constitute key documents for understanding how static force diagrams and geometric models could be translated into architecture, as theorised in his major book 'Spatiology'. *The morphology of the natural sciences in architecture and design* [Giorgini 1995].

## Visionary structures: space, geometry, architecture

The reference to Sigfried Giedion's seminal text *Space, Time and Architecture: The Growth of a New Tradition.* [1941], centred on constructive and spatial systems capable of inaugurating a new technological tradition, provides a useful framework for contextualising Giorgini's research. The Florentine architect imagined a future based on innovative

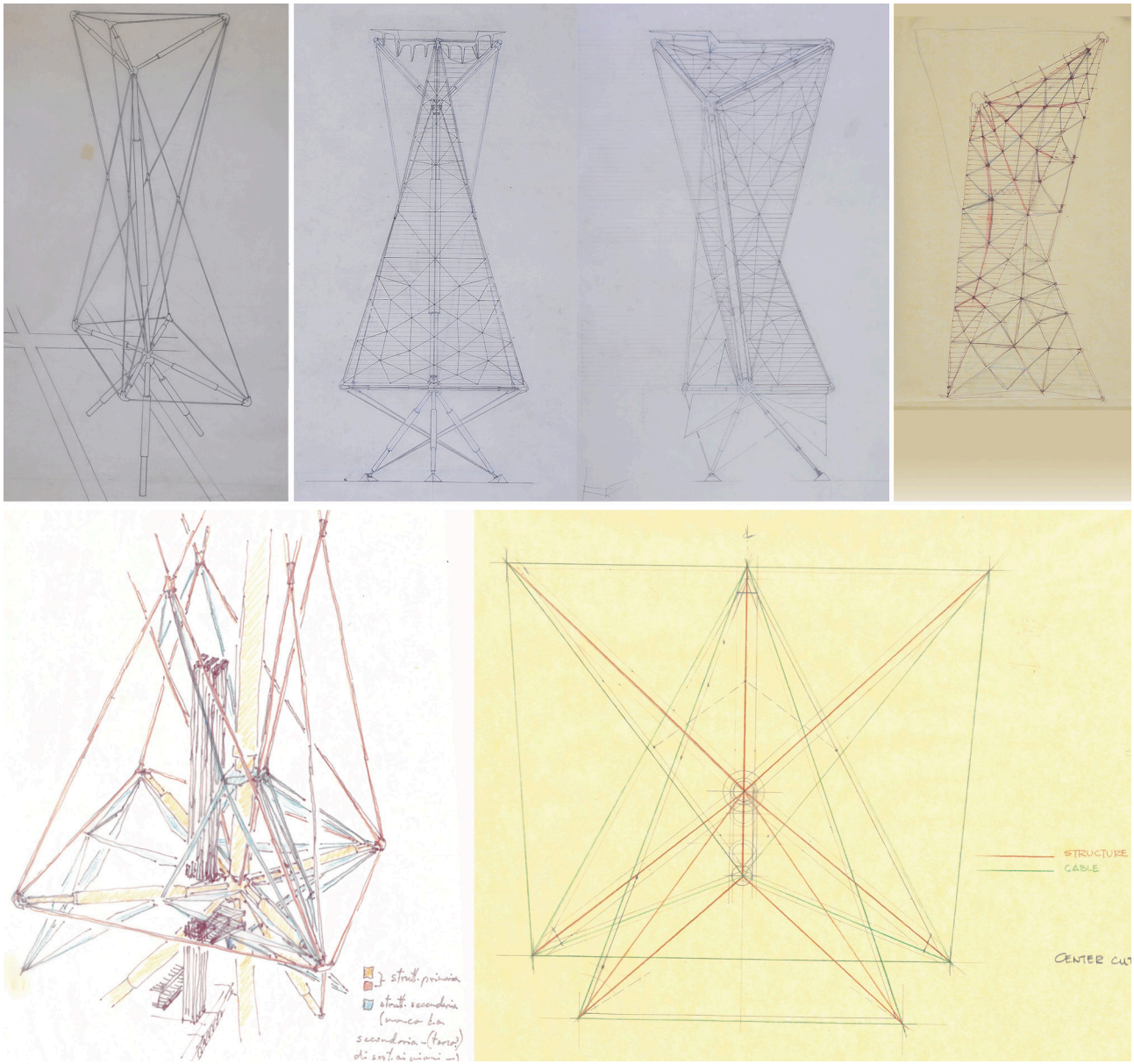



*Fig. 1. Walking Tall: geometric composition and structural elements (B.A.Co.-Vittorio Giorgini Archive).*

principles able to define an unprecedented architectural language, supported by rigorous geometric foundations and strong communicative value. His design visions, utopian in some respects, as many remained unbuilt, were based on spatial regulating structures capable of generating architecture and adapting to different scales and functions. Although highly original, Giorgini was not an isolated case: his experiments were part of a broader cultural landscape shared with contemporaries such as Yona Friedman (1923-2019), Paolo Soleri (1919-2013), Moshe Safdie (1938) and Anne Tyng (1920-2011) [Sky, Stone 1976], with whom he shared methodological and conceptual affinities, as well as connections in the art world. His work can be interpreted along two apparently contrasting design trajectories, recognisable in his early buildings: Casa Saldarini and Casa Esagono. The former is characterised by an organic quality, although Giorgini rejected this label, while the latter displays established geometric rigour. This dialectic reflects the broader tensions of contemporary architectural culture. Despite the diversity of formal expression, geometry remained the foundational core of Giorgini's research, developed through the medium of drawing as a privileged expressive tool. His representations were primarily bi-dimensional, plans, elevations, sections, with only occasional use of axonometric views, while the physical model was entrusted with conveying three-dimensional form, often with a pronounced sculptural character. The complexity of these topics suggests that the analysis began with his Italian houses, which already foreshadow concepts later developed more fully in his American work.

The adoption of experimental design solutions also reveals meaningful connections with contemporaries such as the Italian architect Dante Bini (1932), inventor of the spherical Binishell structures –an innovative construction system for building hemispherical concrete shells via pneumatic inflation [Pennacchio, Ricci 2018]. The affinity with Giorgini lies not so much in formal outcomes, but rather in shared experimental attitudes and the exploration of the potential of concrete in thin structures. This approach is clearly visible in Casa Saldarini, where a material as heavy as reinforced concrete is shaped into a light, sculptural form that subtly evokes nature. The project reinforces a key aspect of the period: the search for new construction technologies able to overcome the static, sceptical attitude towards innovation still dominant at the time [Giorgini 1995]. Conversely, Casa Esagono marks an early step towards a fully geometric conception of architecture. Its formal rigour aligns the project with key figures of structural engineering, such as Konrad Wachsmann and Buckminster Fuller [Edmondson 1986; Ulivieri 2025]. The building expresses a fundamental geometric principle: tessellation –the occupation of a plane through a figure that repeats without interruption. A notable example of this line of research is the Olivetti factory in Harrisburg, designed by Louis Kahn (1901-1974) in the '70s: a complete spatial tessellation generated by the planimetric intersection of two squares, producing an alternation of irregular octagons and squares. Particularly significant is the roof designed by Renzo Piano (1937), composed of an innovative system of square-based pyramids in fibreglass. Innovation and experimentation therefore represent essential elements of the time – and are equally central to Giorgini's vision. The geometric intuitions first explored in Tuscany gained new coherence in the United States, where the two-dimensional ideas of *Casa Esagono* evolved into fully three-dimensional systems. Giorgini developed interpenetrating volumetric configurations that define fluid, continuous spaces with spatial dynamism at their core. These outcomes derive from the use of regular Platonic solids, whose aggregation generates a spatial grid expandable in all directions [Del Francia 2000; Ulivieri et al. 2020; Moretti 1952]. These reflections position Giorgini within a broader technical and cultural context while emphasising his singularity. They provide the conceptual basis for the later maturation of his thought, fully expressed in his American projects.

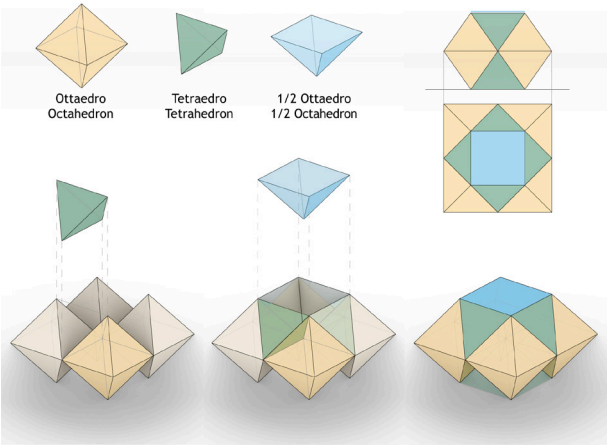



*Fig. 2. Geometric definition of the "Octet parallelogram" (image by the authors).*

*Fig. 3. Spatial visions and formal relations between Giorgini's projects: from left to right: Genesis, Walking Tall, Hydropolis, linked by elevated paths (B.A.Co.-Vittorio Giorgini Archive: coll. PICT0140).*

## The american projects: geometry and structures as principle

"The concept of system and its structure serves as a tool to decipher the nature of phenomena. Given a certain criterion, we can recognise an element as part of an 'ensemble' and understand its relationship with the other parts. When, within a phenomenon, we are able to identify a set of elements, then we are recognising a system" [Giorgini 1995, p. 211].

Giorgini acknowledged the importance of defining distinct yet aggregable design components, governed by geometric principles able to adapt to different functions. Geometry is the true ordering element –from it derive both structure and function. Within this framework, the architect drew a distinction between 'Spatiology', the theoretical study of geometry as a mathematical discipline and foundation of statics, and 'Urbology', which translates such concepts into systems capable of interacting with the city rather than with the single building. The American projects

*Walking Tall* and *Hydropolis* exemplify this approach, as both engage with the urban and infrastructural scale. Although conceived for different functions and characterised by apparently contrasting formal languages, both projects reflect Giorgini's ethical and methodological coherence. They may be interpreted as multi-scalar systems comparable to Jan Lubicz-Nycz's (1925-2011) *'Urbatetture'*, praised by Bruno Zevi (1918-2000) for their abandonment of rationalist stereotypes [Zevi 1965], or to the 'Megastructures' described by Reyner Banham (1922-1988) [Banham 1976]. Giorgini's focus is directed primarily towards urban space: interior layouts remain schematic, while the structural organism, drawn in detail, becomes the true protagonist. Both projects are set in New York, a city Giorgini interpreted as a laboratory for visionary experimentation. The metropolis embodied the ambition to "conquer the sky" through increasingly bold skyscrapers, yet *Walking Tall* was conceived as an antithesis to that model. Designed for a site between 49th and 50th street and between 8th and 9th avenue, the building rises approximately 250 metres high and, thanks to its geometric structure, combines rigidity with expressive lightness [Del Francia 2000, p. 77]. Its programme is highly innovative: a dynamic tower active 24 hours a day, with offices, residences, and studios in the central levels, and public spaces gathered within a tetrahedral crown at the top [Giorgini 1995, p. 240; Guerriero 2000, p. 77]. The tower does not occupy the whole plot: it stands on three tetrahedral steel supports, thus freeing the ground for public use. An elevated walkway, defined as *tetraprismic*, channels pedestrian flows, introducing a new three-dimensional layer of urban circulation.
Volumetrically, the building results from the interlocking of two bodies: a square-based pyramid and a triangular-based pyramid, as shown in the collage drawings in figure 1. The archival material reveals how the tower is organised through hierarchical 'ensembles' and 'sub-ensembles' that define the structural logic.
A crucial aspect concerns terminology: Giorgini rejected the reductive use of the word 'structure' as merely a static or constructive system, insisting instead on its primarily geometric nature, from which technical and functional solutions derive [Giorgini 1995, p. 211]. The tower therefore operates as a tensile structure, based on a primary system of beams and tension cables forming the external profile, and on a secondary internal support structure. The irregular triangular façade grid plays both an expressive and a structural role, likely exposing the load-bearing cables of the floors (fig. 1).

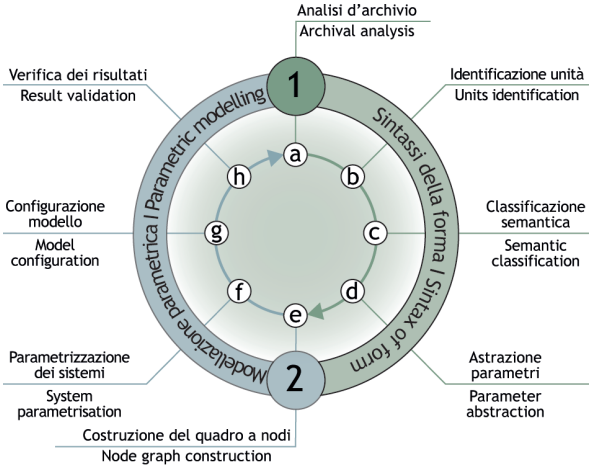



*Fig. 4 Methodological Workflow (elaboration by the authors).*

Despite its differences from earlier works, the project retains clear connections with Giorgini's previous research: the use of Platonic solids, the analogy with natural structural systems, and the absence of a 'main façade'. The building presents no privileged viewpoint, it changes radically depending on perspective, denying hierarchy and proposing an egalitarian spatial condition. Its generative logic also opens to possible aggregation with other architectures, suggesting an urban system rather than an isolated object.
If *Walking Tall* partially conceals its geometric logic beneath a tensile expression, *Hydropolis* makes it explicit. Here Giorgini adopts an analytical approach: he decomposes the project into parts and reassembles them into a coherent unit capable of operating across scales and addressing emerging socio-environmental issues. *Hydropolis* is the first stage of a genealogical sequence that later develops into *Genesis* (1984) and *River Crane* (1993).
The project occupies a portion of the East River waterfront, between 16th and 24th street, an area then subject to a competition for 1,786 dwellings, a 240-room hotel, restaurants, theatres, and leisure facilities [Giorgini 1995, p. 239; Guerriero 2000, pp. 77-83]. The analysis reveals a structural system based on aggregation logics derived from Platonic solids: the octahedron defines the main residential grid, while the tetrahedron regulates circulation

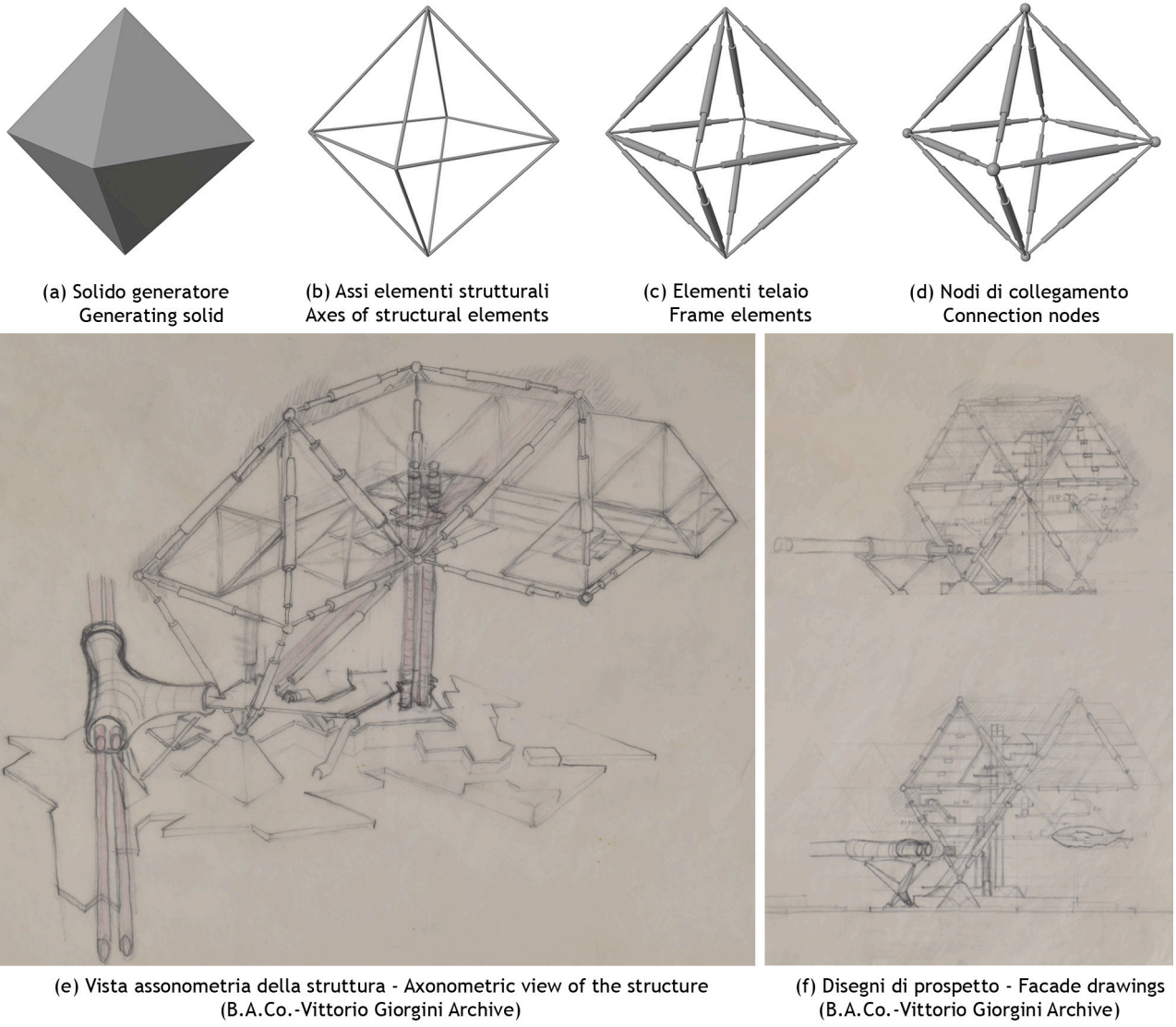



*Fig. 5. Hydropolis: study and modelling of the base structural frame (image by the authors).*

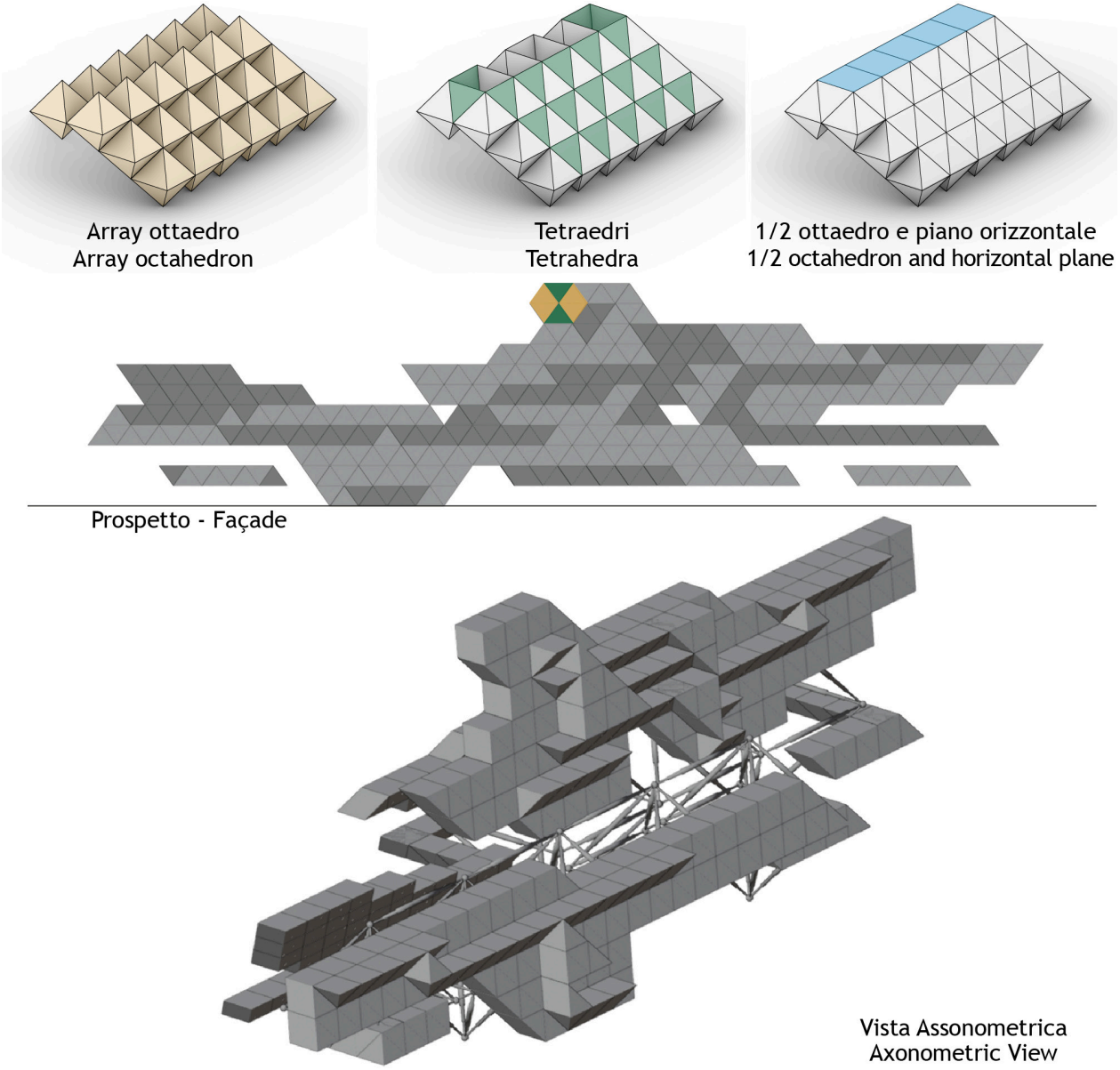
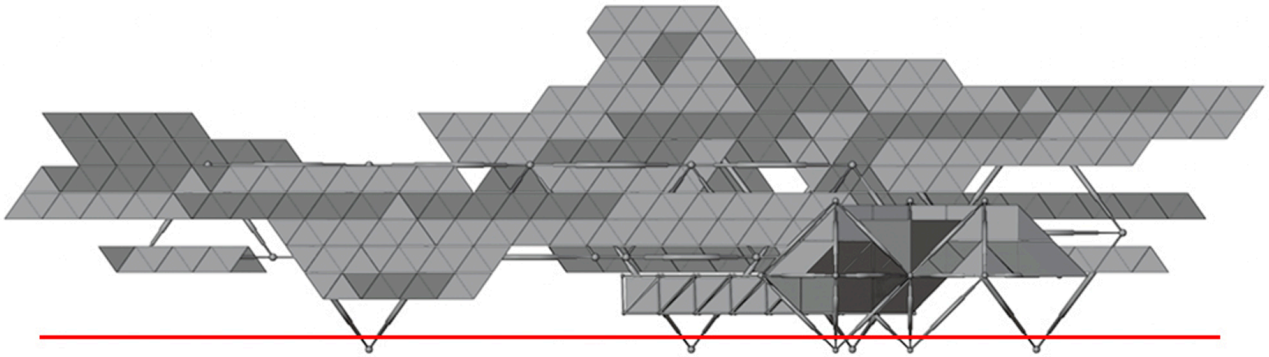
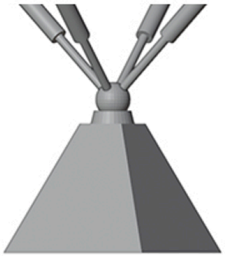


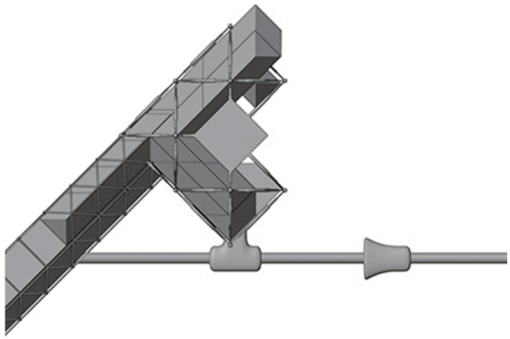

*Fig. 6. Hydropolis: compositional logic of fundamental units (image by the authors).*



(a) selezione dei vertici al di sotto della quota Z
Vertex selection below the Z level



(b) elemento di base
Basic element



(c) modellazione dei cavi mediante nodi di curva
Cable modeling through curve nodes

*Fig. 7. Hydropolis: functional components (image by the authors).*

and infrastructural connections. From a static viewpoint, these solids form a three-dimensional, self-supporting lattice able to withstand 'external forces' without bracing, while entirely occupying space. Their intrinsic stability ensures constructive autonomy, modular replicability, and economic viability.
The building can be divided into three main components: load-bearing trusses, responsible for the structural framework; the geometric grid, giving form to the inhabitable body; systems of connection, both internal and urban.

The main structure consists of telescopic tubular trusses –a continuation of the experimental work begun with *Walking Tall*– organised according to an octahedral lattice and integrated with the unit Giorgini called the "Octet parallelogram" (fig. 2) [Giorgini 1995, p. 244], composed of one tetrahedron and two half-octahedra, required to complete tessellation and define horizontal planes. Internal distribution follows a subtractive logic: the square modules obtained from horizontal sections of the octahedral grid are progressively modified to produce fluid

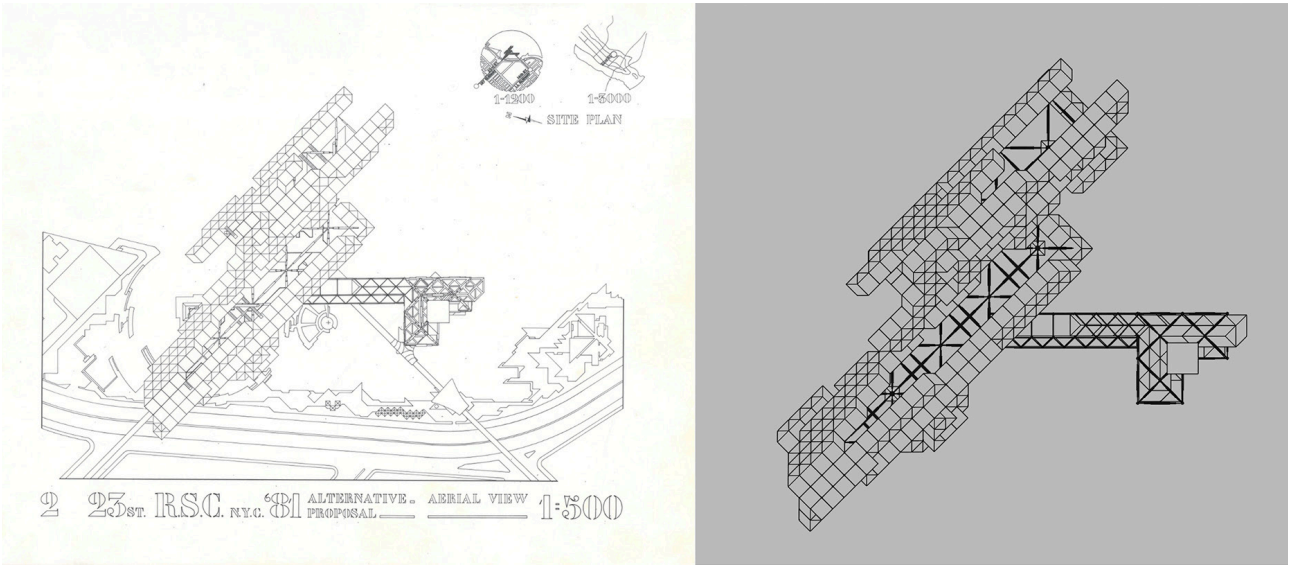



*Fig. 8. Hydropolis: comparison between and original drawings (left) (B.A.Co.-Vittorio Giorgini Archive) and digital model (right) (image by the authors).*

spatial sequences, double heights, and openings towards the exterior. Vertical connections are organised as a tubular system embedded within the frame, comparable to a biological organism, accompanied by an oblique emergent element, presumably with infrastructural and landmark functions.

*Hydropolis* reflects Giorgini's attention to the relationship between architecture and environment, proposing itself as an alternative to the winning entry of the competition: a solution that reinstates continuity with the river and enhances the natural setting. The project is conceived as an artificial suspended island connected to the city through lightweight infrastructures. Its intent is to avoid what the architect called the "pedestal effect" [Giorgini 1995, p. 226] –the monumental imposition of architecture upon the ground. Giorgini openly criticised such approaches, arguing instead for a balanced relationship among building, soil, and air, in line with Le Corbusier's principle of freeing the ground plane. However, a contradiction remains: while the project aspires to environmental integration, its serial vocation makes it theoretically replicable anywhere, thereby losing contextual specificity. In this sense, *Hydropolis* can be read as the first example of an aggregative system later reinterpreted in *Genesis* and *River Crane*. These projects demonstrate how the same conceptual nucleus –an abacus of modular geometric elements'– can generate multiple spatial configurations. The full meaning of *Hydropolis* thus emerges only when interpreted as part of a broader urban vision. In his proposals for New York, Giorgini did not seek to respond to punctual needs, but to outline a 'city of the future' capable of freeing the ground, inhabiting elevated spaces, and re-establishing a relationship between people, city, and nature. In this perspective, architecture becomes part of a complex, sustainable urban fabric –consistent with the principles of 'Urbology' [Giorgini 1982] (fig. 3).

## Generative logics in the architecture of Vittorio Giorgini

The relationship between architecture and geometry is a central theme in Giorgini's work. His architectural forms derive from a combinatory process based on fundamental geometric units –an abstraction that takes material form through the dynamic control of compositional logic.

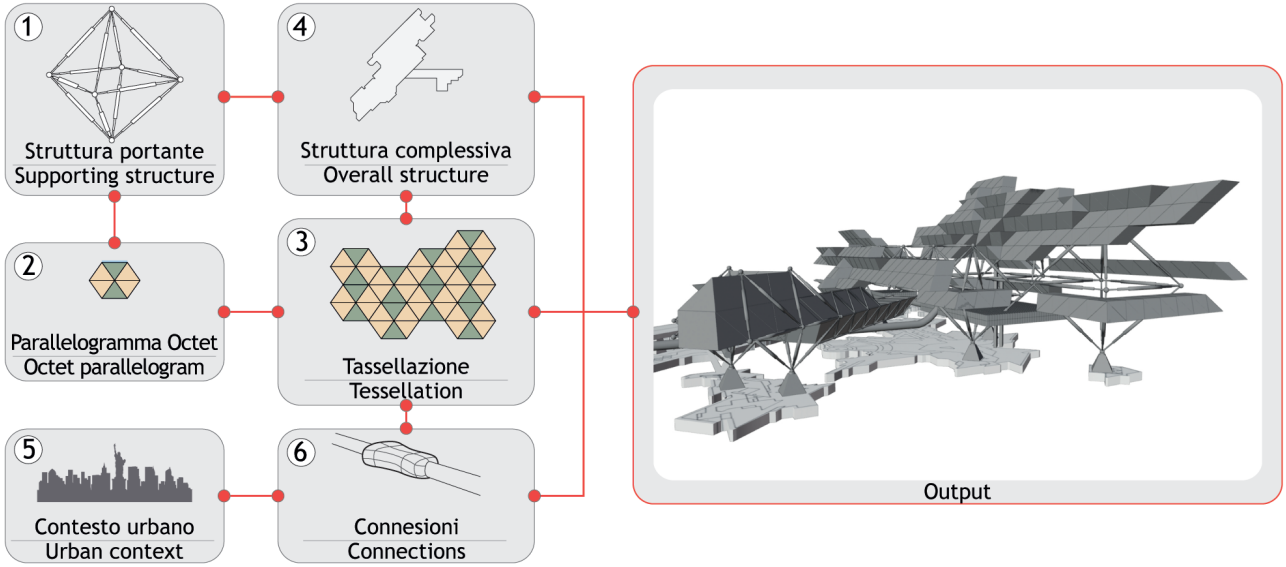



*Fig. 9. Summary of parametric workflow applied to Hydropolis (image by the authors).*

In this framework, procedural modelling tools based on visual programming (VPL) represent a particularly suitable instrument for analysing his architectural thought.
VPL software such as *Grasshopper* or *Blender Geometry Nodes* allows one to go beyond mere digital reconstruction and instead encode entire complex generative systems. These systems can be dynamically modified by acting on specific parameters. The approach makes it possible to identify and parametrise the fundamental geometric units of a project, while managing compositional logic flexibly in relation to context.
The study of *Hydropolis* and *Walking Tall* followed a two-stage methodology: 1) analysis of Giorgini's drawings and manuscripts to identify geometric units, methods of aggregation (overlapping, connection) and overall design logic; 2) VPL digital modelling using Blender's Geometry Nodes to translate the decoded logic into a node-based workflow (fig. 4). Compared to other software [5], *Blender* promotes the sharing and reproducibility of results, in line with Open Science principles. The adopted method allows not only the visualisation of fundamental units, but also the analysis of their compositional flexibility and the validation of their digital transposition in Giorgini's architectures.
Although *Hydropolis* and *Walking Tall* differ in geometric grammar, they share a systematic and procedural nature, which has enabled this method to be tested and validated. The modelling process for *Hydropolis* developed through four main steps, corresponding to the construction and validation of the parametric model:

1. Load-bearing trusses: modelling begins with a generating octahedron. Its edges are converted into variable-radius cylinders forming the structural frame. nodes such as *Instance on Points* and *Array* enable the positioning of connection elements (spheres) and the duplication of structures into linear sequences (fig. 5).
2. Generation of architectural form: the composition is based on the geometric structure of the "Octet parallelogram". By using array nodes, octahedra and tetrahedra are spatially arranged to create three-dimensional tessellation and define levels. Dynamic array control allows multiple volumetric configurations faithful to Giorgini's drawings (fig. 6).

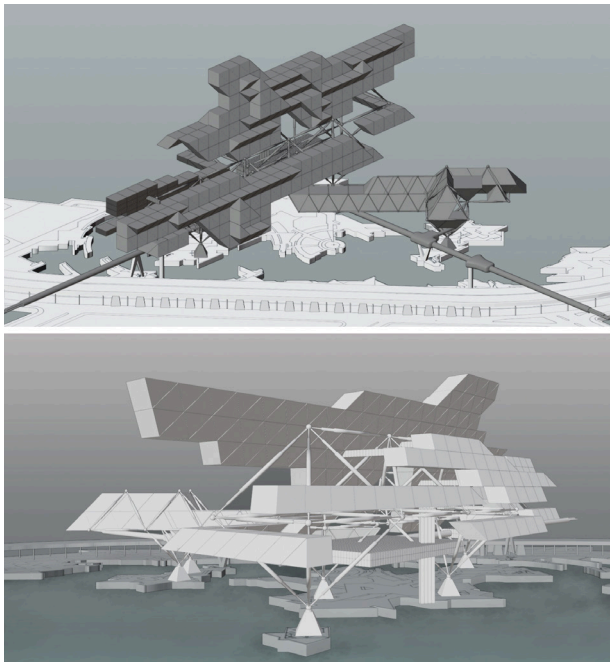


*Fig. 10. Hydropolis: perspective digital views of the parametric model (image by the authors).*

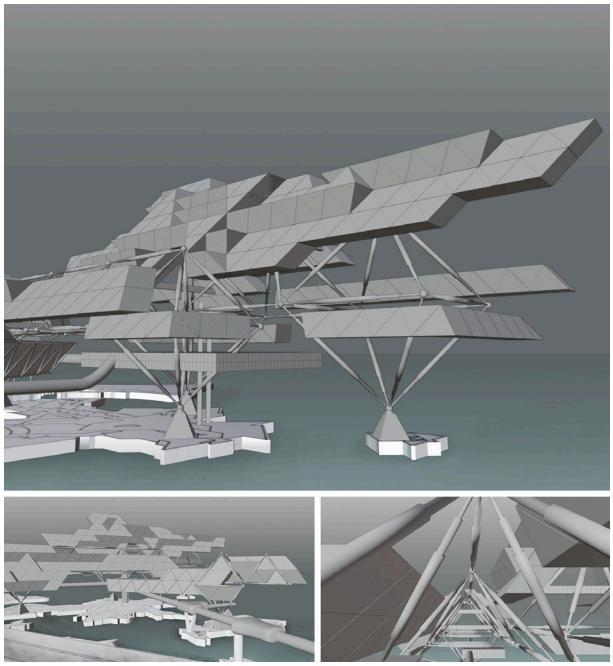
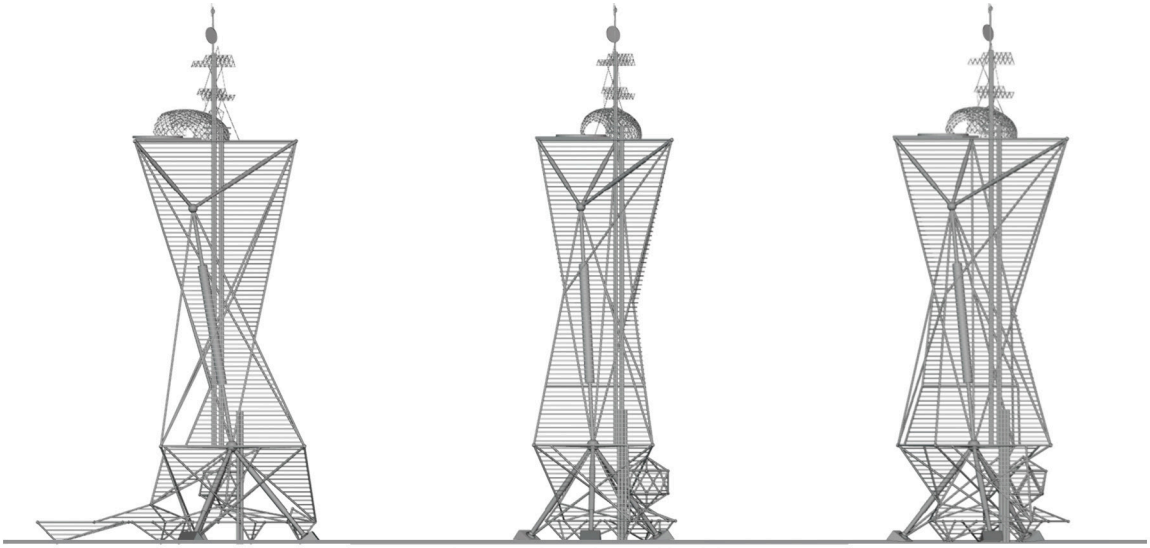


*Fig. 11. Hydropolis: perspective digital views of the parametric model (image by the authors).*

3. Ground connection and cable systems: missing architectural components, such as the connection between trusses and foundation plinths, were modelled using *Solidify* modifiers applied to parametric curves, then integrated into the node system to complete the model (fig. 7).
4. Model validation: the digital model was checked against archival drawings. The match in terms of geometry, proportions, and spatial organisation confirmed the validity of the parametric method, demonstrating how compositional units can be adapted to generate new forms (fig. 8).

The complexity of the node graph was managed through techniques such as *Node Groups*, *Frames*, and *Colour Coding*, facilitating development and maintenance (fig. 9).
The same generative framework can be extended to later projects such as *Genesis* and *River Crane,* which share identical compositional principles (figs. 10, 11).

Unlike *Hydropolis*, *Walking Tall* is based on the combination of inverted square- and triangular-based pyramids forming the structural skeleton. Once again, Giorgini's logic is grounded in geometric lattices and intersection nodes. The floor slabs were modelled as an array of parallelepipeds, while elementary volumes were used to define building boundaries through Boolean operations. The VPL modelling required a separate node graph, demonstrating the method's ability to adapt to different geometric grammars, faithfully reflecting Giorgini's exploratory approach (figs. 12, 13).
The VPL modelling of both case studies validated the coherence of Giorgini's geometric grammar and its effective translatability into operative parametric models. These models thus become dynamic tools for interpreting, visualising, and manipulating the architect's design logic, opening the way to further research and applications.



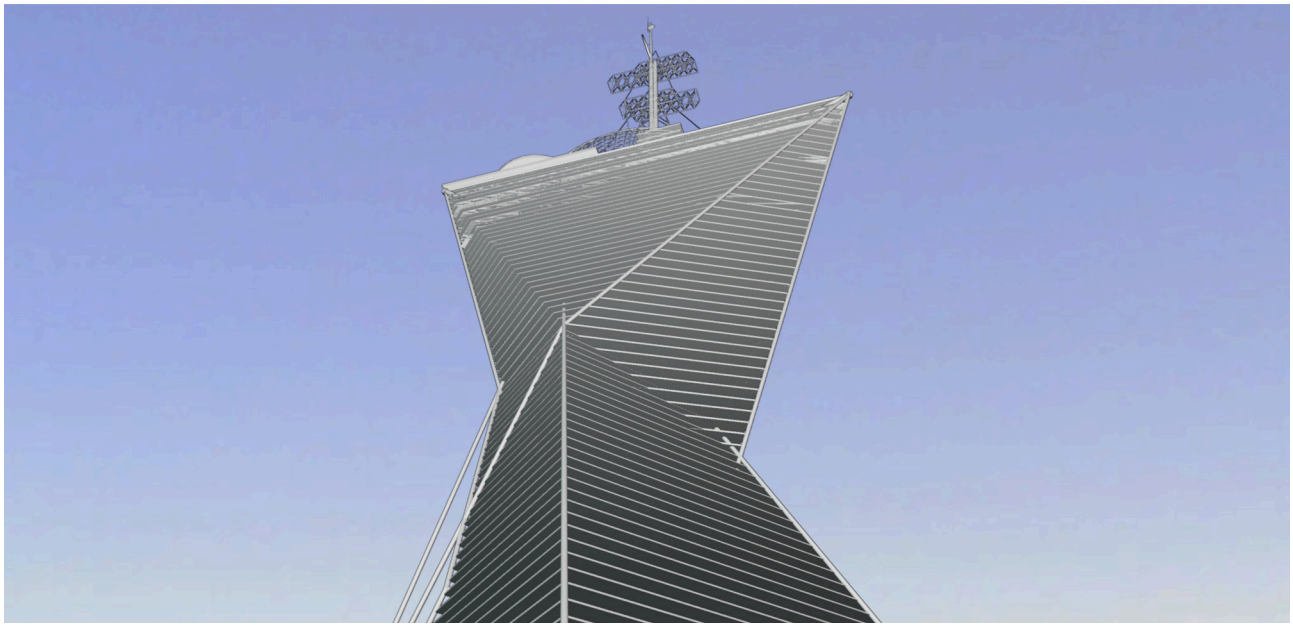


*Fig. 12. Virtual modelling of Walking Tall: frontal and top views (image by the authors).*

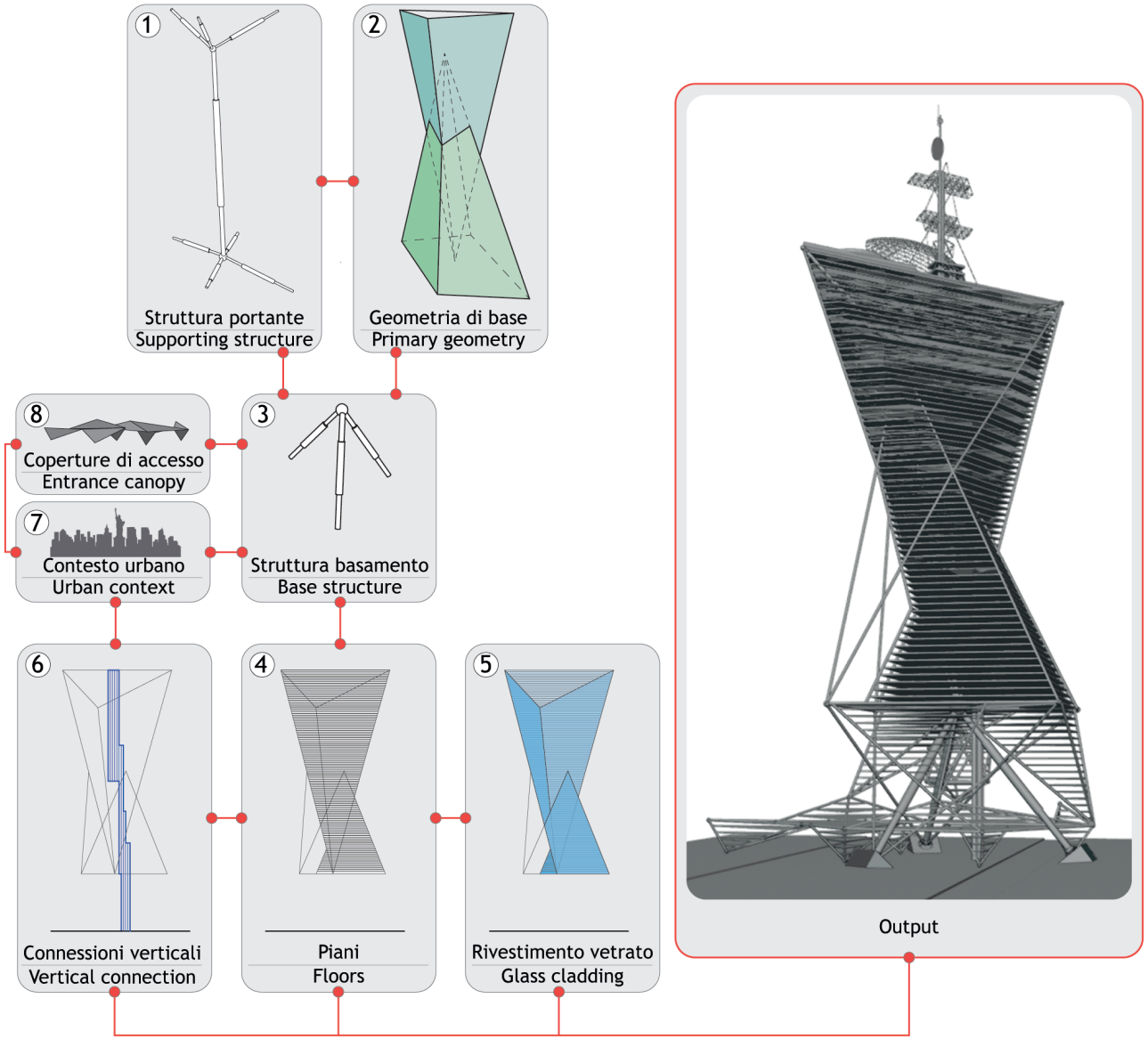



*Fig. 13. Summary of parametric workflow applied to Walking Tall (image by the authors).*

## Conclusions

The analysis of Giorgini's American architectures restores to late twentieth-century historiography a figure of undeniable importance, capable of formulating innovative visions. *Walking Tall* and *Hydropolis* reveal a constant pursuit of an architectural language in which geometry operates as the primary generative and ordering principle, anticipating design methodologies legitimised only decades later by digital tools. His theoretical approach, translated into design terms, shows a clear intention to transcend the limits of the individual building and engage with complex, open, modular, and replicable urban systems. In this sense, Giorgini's research assumes not only experimental, but also ethical and political value: it proposes alternative models of the city able to reconcile urban growth, sustainability, and new relationships between person and environment. The digital translation made possible by VPL tools not only reconstructs unbuilt projects, but also verifies their feasibility, transforming reconstruction into a true testing platform. The shift from 'form' to 'parameter' allows us to grasp the generative logic underlying Giorgini's work, confirming its relevance and its ability to dialogue with contemporary design paradigms. Back in the 1980s Giorgini, already perceiving the creative potential of digital languages, was in contact with MIT, and began experimenting with early CAD software at Pratt Institute [Ulivieri 2025]. Today, in comparison to the tools available to Giorgini, we are able to model not only architectural forms, but the generative logics behind them. A deeper analysis of Giorgini's design genealogy, also through digital methods, could clarify the actual feasibility of his proposals. This is essential in order to distinguish his work from the purely utopian scenarios of his time: Giorgini considered his structures buildable, suitable for serial and mechanised production, and thus economically and constructively viable. Some limits remain, due to the fragmentary nature of sources and the interpretive effort required by complex digital models. Yet this can be read positively: as an invitation to consider the study of Giorgini as an open process capable of producing new hypotheses and variants, exactly like the architectures he imagined. The present contribution highlights the need to rediscover and re-evaluate a designer who, through a multidisciplinary and anticipatory vision, laid the foundations of parametric architecture ante litteram. His American projects are not only an unexplored chapter of architectural history but also provide critical and methodological tools for addressing contemporary design challenges, suggesting future scenarios in which geometry, technology, and utopian vision remain engines of innovation.

#### Acknowledgements

We are grateful to Architect Marco Del Francia for his support and for making available the Vittorio Giorgini Archive.
Although the text was conceived jointly by the authors, Marco Giorgio Bevilacqua wrote the *Introduction* and *Conclusion* paragraphs; Denise Ulivieri wrote *Giorgini: the Florentine Architect in New York* paragraph; Piergiuseppe Rechichi and Zhangliang Shuai wrote *Generative Logics in the Architecture of Vittorio Giorgini* paragraph; Alessandro Meloni wrote *Visionary Structures: Space, Geometry, Architecture* and *The American Projects: Geometry* and *Structures as Principle* paragraphs.

#### Notes

[1] See: Castellano (1987a-b); Del Francia (2000); Ulivieri *et al.* (2020); Ulivieri *et al.* 2022a; Ulivieri, Bevilacqua, Iardella (2022b); Ulivieri (2025).

[2] B.A.Co.-Vittorio Giorgini Archive - Follonica (GR), Italy; Centre Pompidou; FRAC Centre-Val De Loire.

[3] See: Del Francia (2000; 2006; 2011); Ulivieri *et al.* (2020); Ulivieri *et al.* (2022); Del Francia, Ulivieri (2024).

[4] On Giorgini's stay in New York (1969-1996) and his U.S. connections: Ulivieri (2025).

[5] In addition to the software mentioned, examples include: *Grasshopper* and *Dynamo*.

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