1971 Paul VI Audience Hall
Rome, Italy

Pier **L**uigi **N**ervi

Billy Griffits and John David Scott

Pier Luigi Nervi and the Art-Science Divide

Pier Luigi Nervi came of age as an architect-engineer in a divisive time. At the time of his graduation from the Scuola di Applicazione in Bologna in 1913, the seeds of the First World War had already been sown in Europe. A war of a different sort raged in Italy's architecture schools—the ever-present art versus science divide.[1]

In *Pier Luigi Nervi*, Ada Louise Huxtable points to the Age of Reason as the genesis of the split between architecture and engineering—"As empirical rationalism and the veneration of isolated facts took over the age, natural and applied science moved into the field of technology and industry, and out of the realm of art." Architecture, meanwhile, was banished to the "ivory tower of the arts."[2]

The 19th century reinforced the art-science divide; simultaneously, it embodied a paradox that extends into our own time. Huxtable characterizes the 19th century as "an era of color, vigor and power" with a penchant for "the pallid and the picturesque."[3] This is especially true of the first half of the century, which was still engrossed in Romanticism. Viollet-le-Duc, one of the most venerated architects of the 19th century was at the front line of the movement introducing construction and architecture as two sides of the same coin. "Architecture and construction must be taught, or practiced, simultaneously" was his mantra, and it was the key to a renewed knowledge of "the art of building, in which technology and esthetics play an equal part."[4] Unfortunately, he was almost solitary in his views of the field of architecture.

Many of Viollet-le-Duc's competitors and colleagues were adamant that architecture was merely a decoration, meant to hide the true workings of a building, and not to be confused with construction or engineering. Society at this time praised progress and technical innovation while simultaneously venerating the past. This is a sharp contrast to the futurists (and later the modernists) of the early 20th century, who created a cult of progress fueled by utter disdain for the past. In this time period, architecture became a "correct veneer," a device for masking the gritty inner workings of the emerging technological revolution. This was all to change in the years following, as more architects and engineers accepted the truth that Viollet-le-Duc preached, and architecture became about the building and all its constituent parts, rather than the facade of a construction.[5]

The Paul VI Audience Hall is in many respects a counter to this notion of architecture and engineering as separate entities. In *Modern Architecture Since 1900*, William Curtis posits that Nervi "saw structure as an art."[6] Structure permeated every step of his process, while in his finished works, various loads and forces are expressed in clear, honest lines of structure. This dynamic sense of beauty is a fusion of structural function and abstract form, easily read by occupants, a concept Nervi often referred to as "…the inherent esthetic force of a good structural solution."[7] While Nervi's contemporaries could achieve similar spans and heights using emerging technologies, they often neglected these artful nuances that seem to belong exclusively to Nervi's work.

At the time of the Audience Hall's completion in 1971, Nervi had already led an illustrious career; he was widely regarded as one of the world's most resourceful engineer-architects. Throughout his career, Nervi redefined the limits of large-span structures. His early industrial projects and aircraft hangars were the inception of this tradition of pushing the boundaries of structure and material. And yet Nervi was never concerned with extravagance for the sake of extravagance, an idea explored by Spiro Kostof in *A History of Architecture*—

> "Structural exhibitionism was, in fact, a good part of this crowd-pleasing imagery. And it tended to annoy resourceful engineers…who could produce equally arresting spaces, but did so through the inherent logic of the structure rather than for a figurative purpose."[8]

The Audience Hall, like all of Nervi's projects, attains its form from the demands of the program and the constraints of its material, *ferrocemento*. This perfection of this particular material is one of Nervi's masterpieces, the culmination of decades of research and testing—

> "Ferro-cemento is a thin, flexible, elastic and very strong material composed of several layers of fine steel mesh…sprayed with cement mortar; the total thickness of the slab [is] little greater than the bulk of the mesh."[9]

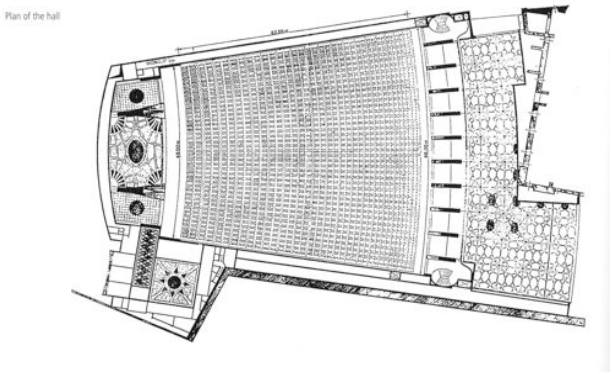

Fig 1. Reflected Roof Plan.

In plan, the main space of the Audience Hall takes on a trapezoidal shape, tapering at the stage (see Fig. 1). It is a subtle gesture but one that achieves one of the primary goals of the Hall—to focus the audience on the Pope. This is reinforced in section—all of the structural lines converge at the front of the hall and are anchored by large columns that flank the stage (see Fig. 2-3). In the same way that the spiritual intensity of a papal audience is focused on the stage, the dynamism of Nervi's project is focused on a single space.

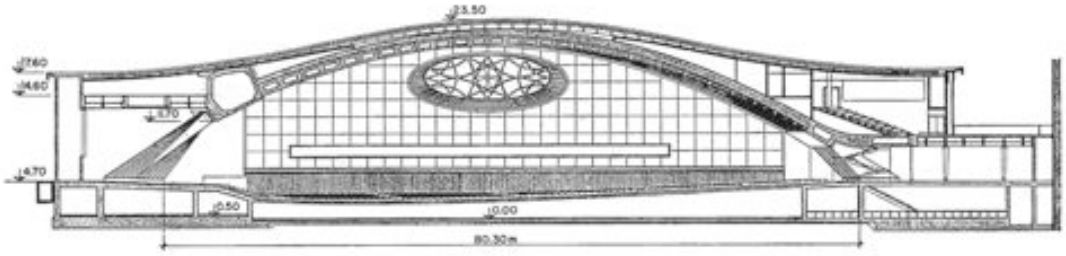

Fig. 2
W-E Section through the Main Space.

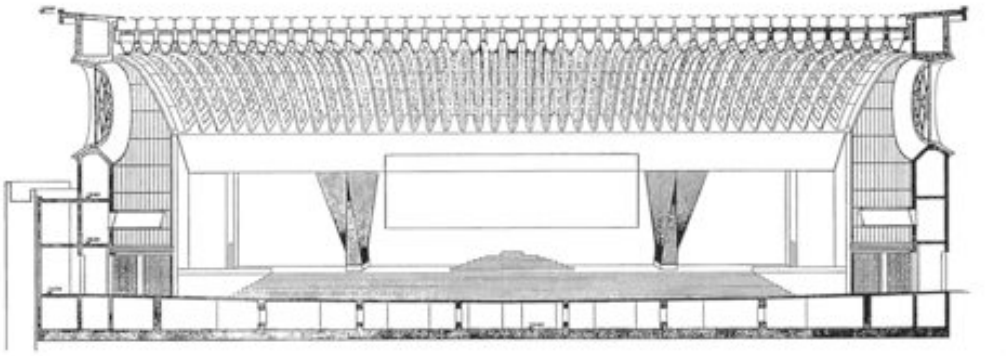

Fig. 2 N-S Section through Main Space.

What truly distinguishes the Audience Hall from Nervi's body of work is the treatment of natural light. The ribbed blocks of *ferrocemento* that make up the spanning elements are perforated; the ceiling of the Hall is essentially comprised of scores of these small apertures. While Nervi had certainly experimented with this in the past (most notably in his Turin Exhibition hall), he had never applied it with such rigor. In the Audience Hall, the ceiling takes on an ethereal quality; it is constantly changing in accordance with the quality of natural light.

This particular design decision is rooted in the program of the Hall. Papal audiences are official papal appearances organized by the Vatican. In reality, there are two subcategories of papal audiences. For large crowds of the faithful, audiences are held in St. Peter's Square. The Paul VI Audience Hall, on the other hand, is designated for "audiences granted by His Holiness to Heads of State, Heads of Government, Governmental Ministers and other dignitaries, as well as to Ambassadors who come to the Vatican to present their Letters of Credence."[10]

When this distinction is considered, the decision to create a translucent ceiling in the Hall is entirely logical. Nervi intended the Hall to exist in the same lighting conditions as the neighboring plaza; his ceiling of perforated *ferrocemento* becomes an abstracted sky of sorts. Ultimately, he wanted to break down the distinction between the two forms of papal audiences. In the Audience Hall, heads of state and other prominent figures are exposed to the same sky as the average person in St. Peter's Square. This profound sense of place in Nervi's project serves as an

equalizer in this sense; it challenges notions of class or status in relation to religious faith.

In addition to adding a degree of resolution to the art versus science debate in architecture, the Audience Hall is a prime example of architecture that is able to unify history and the present. This is especially interesting given the unique context of the project. The Audience Hall rests next to St. Peter's Basilica, one of the most storied pieces of architecture in existence. As Curtis observes, "Nervi, who took pride in the purity of his intuitive and inductive methods of design, achieved buildings which seemed happy descendents of the grand constructions of antiquity."[11] When the Paul VI Audience Hall is examined not simply as an object but as a component of the overall plan of the Vatican, Curtis' view begins to gain relevance. While Nervi's work is clearly not Neoclassical, it is also not a complete departure from its context. The Hall is a "happy descendent" of Italy's rich artisanal history—the prefabricated blocks of *ferrocemento* that form the large spanning structure are extremely intricate and required an unparalleled level of patience and craft. The building is clearly influenced by classical examples—the "visual tension of Gothic ribs and flying buttresses, as well as the principle of classical coffering in antique examples such as the dome over the Roman Pantheon"—yet it is far from an overt copy of these forms.[12]

This particular strength of the project can be traced back to its creator—"Nervi was an engineer with a developed historical sense: he bridged the worlds of modern technology and antiquity, at the level of principles rather than just appearances."[13] Nervi's architecture captures the essence of its surroundings without relying on form-borrowing or other approaches found in many Neoclassical or Beaux Arts works. It is at one time new and old, a celebration of both the present and the rich history that engulfs it.

Nervi and the "Truthful Style"

The work of Pier Luigi Nervi can be viewed largely as an attempt to discover what he termed the "truthful style." This brings to mind the evolution of the International Style in the 1920s and 30s. The International Style was a response to the horrors of the First World War and the ensuing modernization that engulfed much of the developed world. It was an attempt to unify the built environment—to create a sort of standardized architecture. Three characteristics eventually came to define the International Style: an expression of volume of a space, rather than its mass and weight, the creation of a designed balance, instead of preconceived symmetry, and doing away with ornamental facades, exposing the interior structure of a building to the world.[14] In the same way that Mies and Le Corbusier sought to create a universal style, Nervi was constantly seeking a resolved, perhaps finalized formal language. This can be seen in Nervi's recurring interest in the "form-type," the "transition to poetry," and the pursuit of "technical correctness" in his projects.

> The idea of the "form-type" is rooted in Nervi's process—
> "The first step in any design was the search for the most suitable structural solution technically and economically; then followed patient

> and passionate work: the detailing and calculation of the various structural elements so as to refine the form and thus meet the static and structural requirements"[15]

Nervi's approach is methodical. He begins with broad ideas of form and structure; then comes a gradual narrowing of options as certain variables are introduced. Ultimately, the project emerges from this delicate interplay between the initial concept and the constraints. This is what theorist Stanford Anderson cites as Nervi's overall intent—"The rational development of this intuited solution leads to 'a 'form-type'—a form that will not change' because it adheres as faithfully as possible to natural laws."[16] It is important to note that the "form-type" is an entirely authentic result that can be directly attributed to its designer. This is an idea Tullia Lori explores in *Pier Luigi Nervi*—"The 'Nervi system' is based on two original inventions: a material, ferrocement, and a construction process, structural prefabrication." [17]

Though the "form-type" is intended to be fixed and resistant to change, it does not fully exemplify the "truthful style." It must be supplemented by a more subtle step in Nervi's design process—"the transition from technical correctness to poetry is determined by variations in relationships and in detailing so slight that they will always fall within the margin of freedom allowed to any creative activity."[18]

This is when Nervi the "creative engineer" emerges.[19] Though his body of work is defined by large, structural gestures, it is his attention to minute details that truly creates spaces of value and distinction; Nervi maintained that a design was only valid if "worked out passionately in detail." This can be seen in his drawings for the Turin Exhibition in 1947. The roof, which spans over ninety meters, was built at a blistering pace, with the exhibition hall fully finished in ten months. This speed and efficiency was "in part thanks to the first large-scale application of the 'Nervi method'," the fusion of Nervi's two critical inventions.[20] The ferrocement was cast in four meter long blocks and raised to the roof once hardened, where it was casted into position, creating the monolithic structure of the Turin Exhibition complex. The levels of detail present in Nervi's drawings - right down to the exact dimensions, angles, and material properties present in the sections – bring the space to life on the paper.

To Nervi, the ultimate indicator of the "truthful style" is what he calls the "technical correctness" of a project—that is, the creation of a "'structural architecture' of technical efficiency."[21] In *Aesthetics and Technology in Building*, Nervi affirms this—

> "But above all I think that technical correctness, the essential element of a truthful style, will force upon all architecture ethical standards which will lead to ordered and attractive public and private environments, whose silent educational action will be reflected in the lives and feelings of men."[22]

In this assertion, it becomes clear that Nervi's ambitions extended far beyond the creation of a "truthful style." His vision of environments directly influencing the "lives and feelings of men" resembles the sweeping, utopian visions of the modernists and, to some extent, their forefathers. Nervi's enthusiasm is countered by his American contemporary, Robert Venturi—

> "The architect who would accept his role as combiner of significant old clichés—valid banalities—in new contexts as his condition within a society that directs its best efforts, its big money, and its elegant technologies elsewhere, can ironically express in this indirect way a true concern for society's inverted scale of values."[23]

Venturi and Nervi form an interesting juxtaposition. Perhaps their most obvious difference can be seen in their respective worldviews. Venturi's writings display an utter disdain for the ethos espoused by Nervi. He sees futility in the efforts of architects to create socially relevant works because society, in his eyes, is comprised of an "inverted scale of values." This explains much of Venturi's work in both theory and design. He embraced the very things modernism stood against—from the billboards of the Las Vegas strip to the architecture *parlante* of Michelangelo and Palladio.

Anderson views Venturi's outlook as an architectural dead end, a point of stagnation—

> "Venturi's pessimism about the social condition and theoretical level of architecture leads him to a state of resignation. He has thrust the old clichés out of his 'platform'; but his image of the architect is as an organizer of clichés, employing the technology of 1866."[24]

Contrastingly, Anderson recognizes Nervi's oeuvre as "a positive step in contrast to a position of resignation."[25] Nervi's relentless desire to find the truth in all parts of architecture and design paved the way for architects of later generations, those who embraced the idea of forward momentum, like the Futurists, to create new and bewildering structures that utilize new forms of structure and material. Venturi, on the other hand, lacking faith in the condition of mankind, suffers from a "state of resignation" as described by Anderson. His designs do not provoke forward thought, nor do they embrace a spirit of modernism. Rather, they outwardly state a desire to do away with old clichés, while inwardly they hypocritically embrace the same clichés. The designs, much like the designer, lack conviction in humanity, and as such, are not nearly as inspiring or uplifting as Nervi's ferrocement edifices.

Sacred Space Redefined

Nervi's Audience Hall is, at its core, an intersection of two profound ideas in his life's work—the relentless search for the "truthful style" and the creation of an architecture of optimism. In a broader sense, the building serves to challenge (and

ultimately redefine) ideas of what sacred architecture can and should be.

A prime example of this challenging or rethinking can be found in the material choices for the Audience Hall—

> "Every element in the structure is in fact made of white cement, blended with special inert matter containing fragments of Apuan marble. All the surfaces are left exposed and no finishing material is used, ensuring that cement, traditionally considered a poor, sad material, is here given the same worth as the precious stones employed in the nearby basilica."[26]

The choice of marble from the Apuan Alps is an important one. In its materiality, the building is rooted in its surroundings (the Apuan Alps are a mountain range in Tuscany). Nervi finds a certain degree of dignity in using local materials.

Nervi's decision to leave the *ferrocemento* unfinished has roots in modernist theory. Huxtable sees structure as "the basis of modern architecture."[27] If this is in fact the case, then Nervi's work represents a clear articulation of modernist principles and perhaps even the "truthful style" he sought throughout his career. The materiality of the Paul VI Audience Hall is also a challenge to conventional religious thought, particularly pertaining to the design of sacred spaces. Nervi's use of concrete, a "poor, sad material," is no accident. It is a commentary on the futility of relying on precious materials to create a sense of the divine—in his Audience Hall, Nervi demonstrates that space achieves sanctity through structure and thoughtfully designed spaces, not expensive skins or claddings.

The Paul VI Audience Hall Re-Imagined

In the summer of 2008, the roof of the Paul VI Audience Hall was retrofitted with a vast array of photovoltaic panels. The array now supplies the building with sufficient energy for all of its yearly heating, cooling, and lighting needs.[28] The installation has been rightly hailed as a proactive step towards halting climate change; yet there is a deeper connotation present. This is yet another instance of a structure that proves to be highly adaptable to new circumstances, a work of architecture that never ceases to incite dialogue and thought. The success of the retrofitting is also a testament to its creator, a "creative engineer" whose dedication to process and human welfare now exist in built form.

Notes

1. Ada Louise Huxtable, *Pier Luigi Nervi* (New York: Brazilier, 1960), 21.
2. Ada Louise Huxtable, *Pier Luigi Nervi* (New York: Brazilier, 1960), 11-12.
3. Ada Louise Huxtable, *Pier Luigi Nervi* (New York: Brazilier, 1960), 12.
4. Ada Louise Huxtable, *Pier Luigi Nervi* (New York: Brazilier, 1960), 13.
5. Ada Louise Huxtable, *Pier Luigi Nervi* (New York: Brazilier, 1960), 12.
6. William Curtis, *Modern Architecture Since 1900* (New York: Phaidon, 2009), 375.
7. Ada Louise Huxtable, *Pier Luigi Nervi* (New York: Brazilier, 1960), 10.
8. Spiro Kostof, *A History of Architecture* (New York: Oxford UP, 1995), 739.
9. Ada Louise Huxtable, *Pier Luigi Nervi* (New York: Brazilier, 1960), 19.10. The Holy See, "Profile," Prefecture of the Papal Household, www.vatican.va/various/prefettura/en/profilo_en.html.
11. William Curtis, *Modern Architecture Since 1900* (New York: Phaidon, 2009), 480.
12. William Curtis, *Modern Architecture Since 1900* (New York: Phaidon, 2009), 375.
13. William Curtis, *Modern Architecture Since 1900* (New York: Phaidon, 2009), 375.
14. William Curtis, *Modern Architecture Since 1900* (New York: Phaidon, 2009), 192-196.
15. Frederick Praeger, *The Works of Pier Luigi Nervi* (New York: 1957), 1.
16. Stanford Anderson, "Works: Aesthetics and Technology in Building by Pier Luigi Nervi," *Journal of the Society of Architectural Historians*, 25 Nov., University of California Press.
17. Tullia Iori, *Pier Luigi Nervi* (Milan: Minimum, 2009), 26-27. 18. Stanford Anderson, "Works: Aesthetics and Technology in Building by Pier Luigi Nervi," *Journal of the Society of Architectural Historians*, 25 Nov., University of California Press.
19. Frederick Praeger, *The Works of Pier Luigi Nervi* (New York: 1957), 1.
20. Tullia Iori, *Pier Luigi Nervi* (Milan: Minimum, 2009), 42.
21. Stanford Anderson, "Works: Aesthetics and Technology in Building by Pier Luigi Nervi," *Journal of the Society of Architectural Historians*, 25 Nov., University of California Press.
22. Stanford Anderson, "Works: Aesthetics and Technology in Building by Pier Luigi Nervi," *Journal of the Society of Architectural Historians*, 25 Nov., University of California Press.
23. Stanford Anderson, "Works: Aesthetics and Technology in Building by Pier Luigi Nervi," *Journal of the Society of Architectural Historians*, 25 Nov., University of California Press.
24. Stanford Anderson, "Works: Aesthetics and Technology in Building by Pier Luigi Nervi," *Journal of the Society of Architectural Historians*, 25 Nov., University of California Press.
25. Stanford Anderson, "Works: Aesthetics and Technology in Building by Pier Luigi Nervi," *Journal of the Society of Architectural Historians*, 25 Nov., University of California Press.
26. Tullia Iori, *Pier Luigi Nervi* (Milan: Minimum, 2009), 75.
27. Ada Louise Huxtable, *Pier Luigi Nervi* (New York: Brazilier, 1960), 17.
28. Leah Krauss, "Solar World: Vatican Installs Solar Panels," *United Press International*, 31 May 2007, http://www.upi.com/.