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PIER LUIGI NERVI:

MODERN TECHNOLOGY FOR CLASSICAL TYPOLOGY

It is not the most comfortable task to justify the reason for choosing a topic for research. In my particular case however, the choice of investigating the works of Pier Luigi Nervi was almost obvious. I am an Italian architect doing research in an English School of Civil Engineering. Nervi was an engineer who regarded himself, and was regarded, as an architect (in 1945 he founded the APAO - Association for the Organic Architecture together with Bruno Zevi). He taught for 17 years (1945 – 1962) at the Faculty of Architecture in Rome which he, among others, founded. He was awarded many prizes for architecture, including the Royal Gold medal in 1960. Indeed he was one of the very few “non-architects” to win this prestigious award in recent years.

The choice of Nervi seemed to me a perfect link between Architecture and Engineering. This proposal was successful and so in January 2003 I started this research under the supervision of Prof. Neil Jackson (Architect and Architectural Historian, professor at the University of Leeds) and Dr. John Forth (Structural Engineer and lecturer at the University of Leeds).

My first commitment was to review the written material on Nervi and after having read all the most important works, I realised I was very disappointed at the quality of criticisms of these works. Most of them are just photographic reportage of his buildings with some caption comments; others focused on some very peculiar aspects of his life (he being a structural engineer in a world of architects, being the only Italian in a cultural world of North-Europeans, and so on). Even his own books are in some sense are not very satisfactory. They were mainly written for the students of schools of architecture and for this reason they are very didactic. The few times he quotes one of his buildings he does so just to provide examples of a particular use of reinforced concrete. As an architect I was more interested to his design process than his structural and technological inventions, at least that was my priority.

As a PhD student in the University of Leeds I am surrounded by many other students carrying out their research in different disciplines. By sharing our experiences (even if it was not exactly clear to me what they were doing) I formed the opinion that for any kind research one of the most important

points is the formulation of the hypothesis to be proved. It is impossible to think of research without having defined a direction; one risks becoming a collector more than a researcher.

So, I needed a hypothesis. Having learned enough about him and his professional life I was finally able to formulate one.

What I was looking for was what was beyond his material production: his “theory” of design, the influences of “external context” on his buildings. This concept is very often used in the History of Art and Architecture. Many times in order to explain some important character or work we refer to external reasons or sources which are apparently far removed (using the Theory of Relativity to explain Cubism is just an example).

My hypothesis is that he had his own “theory” which was far more complex than what he himself claimed; his “faith in the aesthetical value of the static law”<sup>1</sup> was too simplistic for me. I simply could not accept that Pier Luigi Nervi, despite his many collaborations with architects (Gio’ Ponti, Marcel Breuer) during his long career, and despite having been considered as a master by many younger architects<sup>2</sup> is still seen as a unique figure, not linked at all to a wider cultural context.

As your English poet John Donne said, “ No man is an Island ”.

*(Meditation XVII)*

Having this hypothesis in mind, my next decision was how to proceed. First, I decided to take into consideration some particular buildings rather than his complete *Opera*. I chose the buildings for the 1960 Olympic games in Rome; his most famous works:

The *Palazzetto dello Sport* (little sport palace)

The *Palaeur* (big sport palace, EUR<sup>3</sup>)

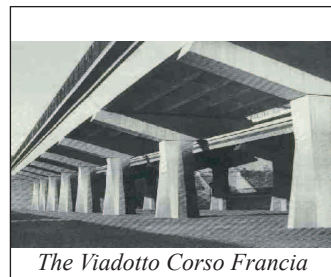
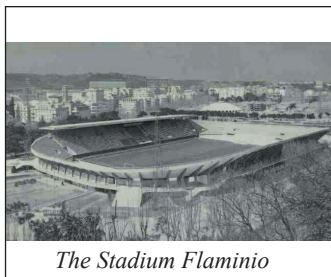
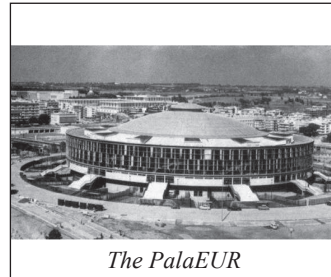
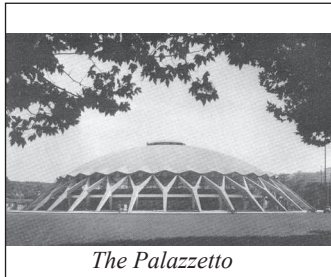
The *Stadio Flaminio* (Stadium)

The *Viadotto Corso Francia* (Urban elevated roadway):

Apart from their world-wide acknowledged architectural value, there are other reasons for their fame:

- The International resonance they received on the occasion of the Olympic games of 1960.

- The fact that they are in the centre of Rome, a city of four million inhabitants, which “uses” Nervi’s buildings daily. <sup>4</sup>
- The fact that they are in two very special areas of the city. The Olympic Village and EUR are by far the most important zones for contemporary architecture.



I decided to investigate the original sources; the design process is to be discovered on the original drawings even before approaching the very buildings. One of my Italian lecturers Prof. Giuseppe Zander taught me that the only way to really understand a building is to re-draw it. I agree. After a while (bureaucracy is one of the major obstacles for historical research) I managed to obtain copies of every original Nervi drawing of the *Palazzetto*. At the same time I was also looking also for another kind of source, something that was able to give me quick feedback to the many questions on his professional and personal life. During a conversation with Prof. Piero Ostilio Rossi of the Faculty of Architecture “*La Sapienza*” in Rome, the Engineer Mario Desideri was mentioned. He has been working for more than twenty years (1949 – 1971) in Nervi’s office. I managed to contact him and now he is a sort of “third supervisor”. Access to personal information and to original material (without language barrier) is the fundamental part of the methodology of my research.

Before talking about the *Palazzetto* itself, the special environment that *CONI*<sup>5</sup> (the Italian Olympic Committee) wanted to create has to be considered.

The 1960 Olympic games gave to Rome, and therefore to Italy the possibility to show to the world its re-birth from the ruins of the Second World War. It was an amazing chance to demonstrate the complete recover and to illustrate the ability of the Italians to organise such a multimedia event. Arguably the Olympic Committee (that was strongly linked with the political government) valued carefully who could design buildings capable to represent at the same time the classical tradition of the Italian culture and the capacity of a wealthy and democratic nation to express contemporary architecture.

Pier Luigi Nervi was the perfect choice. He was a deeply Catholic, liberal and politically moderate man, the perfect example of the “new Italian” to present to the world; neither a nostalgic (not so deeply involved in the previous Fascist regime as many “State architects” still working in 1960, during that period he worked merely as a structural engineer), nor a communist (Italian Communist Party at that time was very powerful and counted many intellectuals and men of culture).

Furthermore, he had a vast experience in sports buildings (having already built a stadium in Italy, designed another in Brasil and a sports hall in Vienna). And above all, he had the unique capacity to design and build (being at the same time a designer and a owner of a construction firm) quickly and economically every structure needed.

There is not a shadow of doubt that the Olympic Committee decided to stress the historical link between the ancient capital of the Empire and the contemporary city of Rome. The logo of the Games is the clearest example; a classical capital surmounted by the wolf with Romulus and Remus.

For this reason the organisation decided to place many sport events in ancient sites (Wrestling in the Basilica of Massentius, Gymnastic at Caracalla’s baths, Marathon around the main monuments).



A further reason to consider Nervi as the principal candidate for “Architect of the Olympics” was the tendency in his recent designs towards symmetry and therefore, in the eyes of the Committee, Classicism.



### ***The Palazzetto dello Sport.***

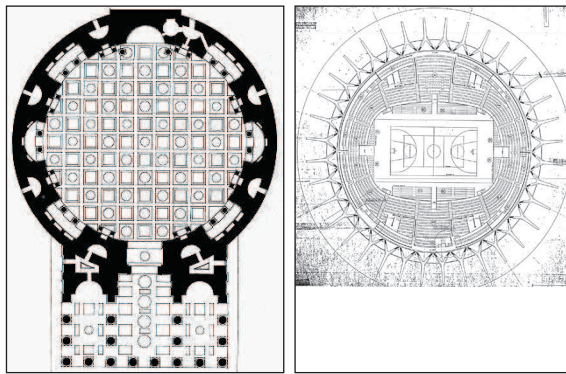
The *Palazzetto*,<sup>6</sup> was conceived as a sports hall in the area of the Olympic Village where the athletes could do exercises and training before the official matches which would have taken place in the bigger “*Palazzo*” (PalaEUR), located far from the athletes’ residences. The architect Annibale Vitellozzi, who was at the time the head architect of CONI, conceived the preliminary design. His simple idea consisted of having a central space clear of vertical structure in order to have a building capable of adjusting itself to the different disciplines (boxing, wrestling, basketball) in a very short time. This simple concept was not easy to realise. The clear area to be covered had a 60 meters diameter. Vitellozzi, an eclectic architect, realised that the only person who could design and build such a structure in the short time available (as usual, in Italy) was Pier Luigi Nervi. In 1956, Vitellozzi involved Nervi as structural designer in the *Palazzetto* project.

What Nervi did was something far more than to provide a “Structure” for an “Architecture”. Nervi was genuinely unable to comprehend such a difference: for him structure was architecture. He probably developed this idea by studying his favourite building material, reinforced concrete. Its most important mechanical characteristic is its monolithicity. Pilasters and beams are linked to a point where it is impossible to distinguish the supporting parts from the supported ones. He conceived structure as a whole-supporting organism, not any longer the “skeleton” separate from the building, but the building itself. Even the details are treated as part of the whole.

In such a cultural atmosphere then, Nervi was called to design a dome, a dome in Rome. Although he was not the first builder to do this, this was certainly a crucial moment for his career. Internationally acknowledged as an innovative designer of contemporary structures he was now called to face one of the most classical themes in the purest tradition of the Italian architecture. Nervi could have been influenced by many wonderful examples that Rome offers but the closest reference was the Pantheon. Many are the similarities between the two buildings.

First, the plan.

The Pantheon is one of the classic examples of the central plan. Until now Nervi had never designed a perfectly centrally planned building, even though a certain tendency towards symmetrical organisms was already clear.<sup>8</sup> Even



*The Pantheon*

*The Palazzetto*

though in the case of *Palazzetto Vitellozzi* first suggested a circular building, Nervi's contribution was substantial. Moreover he used an identical solution for the bigger sports hall, the *PalaEUR*, which was designed by his practice alone.<sup>9</sup>

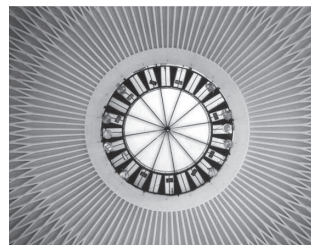
Functional reasons explaining these choices in relation to their particular typology (a sports hall) are belied by the buildings designed and built for the following Olympic Game (Kenzo Tange for example, who in 1961 visited the Nervi's sports buildings, designed a totally different solution for a sports hall for the Tokyo Games, 1964).

Furthermore as well as the Pantheon the *Palazzetto* was designed and perceived essentially as a dome. This element dominates the entire building and, in the end, *is* the building. As everyone knows, Rome has plenty of domes but the only one that alone represents the whole building is the Pantheon. Furthermore, like the *Palazzetto*, it is a hemispherical dome. In both cases, even though with a different solution, the possibility to perceive the pure geometry of the dome is given only by an internal view. This is another similarity between the two architectures; the Pantheon is one of the first architectures in which the interior space forms the external aspect. The

Palazzetto as well as the Pantheon were designed from an internal point of view. Actually, the view from Piazza della Minerva hides the presence of the great dome but once one enters the dark interior space of the ancient monument the vision is marvellous and the temptation to stand under the big *oculus*, in order to become the projection of the centre of the sphere (now completely revealed) is impossible to ignore. The *Palazzetto* is no different. Thought of as a training gym hall and conceived by Nervi essentially as a dome, it needed no sense of scale or representative character, compared with the PalaEUR which shows a certain monumentality, being the “container” of the main sports events. But again, once inside, the presence of the internal dome, amplified by the converging ribs, not so different in terms of visual effect by the five concentric lines of coffers in the Pantheon, suggests that the main view point of both buildings is from inside, for the simple reason that they were especially designed for being looked at from there. The last similarity between the converging ribs and the coffers leads, almost physically, to what has to be regarded as the main symbol of the existing link between the two architectures: the *oculus*.



*The Pantheon*



*The Palazzetto*

The central *oculus* in the *Palazzetto* is a clear quotation of the Pantheon. This opening, absolutely necessary from a functional point of view in the Hadrian building, was in *Nervi's* one completely avoidable. The light was in fact entirely provided by the electrical plant. It has to be said, though, that Nervi as rational engineer used this opening to insert the big crane that built the whole dome, although this categorically can not be seen as its *raison d'être*. Moreover, Nervi proposed this opening for the first time here in the *Palazzetto*. The project of a previous similar sport building in Vienna (1953), that has to be considered as the prototype of the Olympic buildings, is provided by a dome with no trace of central openings. Is it possible to



consider this choice as homage to the Eternal city? The significance of doing this in Rome can be understood when he repeated the move, two years later, in the Palaeur.

The clear use of geometry is the most manifest connection that strongly links the *Palazzetto* to the Pantheon. This implies some similar building solution for the two works; one is certainly the use of a ring foundation.

Both the Pantheon and the *Palazzetto* have a concrete ring foundation. Of course, in two thousand years building techniques have evolved, and so the supporting sections have been reduced. The principle, though, is exactly the same for the two buildings.

In particular the foundations of the *Palazzetto*, represent a very interesting case. In order to support the horizontal force <sup>10</sup> transmitted by the Y-shaped external columns, Nervi had to think of a foundation, normally working only under compression, which was able to stand also the tensile strain. It is not trivial to think of such a foundation in this respect. For this reason, he finally designed a pre-stressed reinforced concrete ring which was used here for the first time in Italy.

Another important piece of evidence has to be added to all the above considerations; the building material.

The Pantheon is the triumph of Roman concrete. Is one of the most wonderful works ever built in this material. The structure represents a marvel for today's engineers who would not dare build a building of this magnitude in the manner it was built in ancient Rome. Reinforced concrete, of course, did not exist at that time. The Pantheon was built entirely without steel reinforcing rods which resist tensile cracking. The dome is constructed of stepped rings of solid concrete of decreasing density as lighter aggregate (pumice) was used, diminishing in thickness to about 1.2 m at the edge of the *oculus*.

Nervi used a very similar material more than 2000 years later. His studies were focused on the perfecting of the technology of reinforced concrete and on the reduction of the proper weight. These two objectives brought him to ferro-cement, a modern solution not so different in terms of weight from the material used for the Pantheon which was invented and patented by Nervi.

If Nervi really meant to quote the Pantheon or if he was just unconsciously influenced by it, at the present it cannot be said. The certain fact is that Nervi

shows here, as elsewhere, a great attention to the history of Architecture, and to the specific urban context.<sup>11</sup>

Despite being considered only as an irreducible modernist, the name of Pier Luigi Nervi has to be added to those of the gigantic figures of Brunelleschi, Bramante, Michelangelo, Borromini, and Juvarra as a great Italian builders of domes.

It is really difficult to ascertain if Nervi was aware of being part of this tradition and therefore, consciously stressing the link with his predecessors or if he, by the simple fact of being Italian, in facing the architectural problem of building a roof, opted for the most natural solution , for an Italian :

the Dome.

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## Notes

<sup>1</sup> “ I believe, therefore, that the school of architecture should above all teach structural correctness, which is identical with functional, technical and economical truthfulness and is necessary and sufficient condition of satisfactory aesthetic results.”

Pier Luigi Nervi, *Structures* (New York, 1956) p. 26.

<sup>2</sup> Renzo Piano, *The Renzo Piano Log Book* (London, 1997) p.17

<sup>3</sup> EUR 42, acronym for *Esposizione Universale Romana* 1942 (Roman Universal Exhibition, 1942). A complete new district designed in 1937 by many young architects (Libera, Pagano, Piccinato, etc...), under the supervision of Marcello Piacentini. It was supposed to be the “container” of the Universal Exhibition programmed in Rome in 1942, which never took place due to War reasons. Considered by most as the vulgar triumph of Fascist Architecture, it has been recently re-valued.

<sup>4</sup> It is not the same for most of his buildings. Some are far from towns (hangars, factories) and others are used only rarely (big exhibition halls).

<sup>5</sup> CONI, acronym for *Comitato Olimpico Nazionale Italiano*. The Comitee, was formed in 1955 to organise and represent the Roman edition of the Olympic games. It still exists, being the highest authority in Italian Sport.

<sup>6</sup> *Palazzetto*, small Palace; in Italian, diminutive for *Palazzo*.

<sup>7</sup> Nervi even designed the seats in reinforced concrete.

<sup>8</sup> Examples of Nervi’s previous works having circular parts within a more complex building are to be found in the exhibition hall in Turin (1947) whose solution for the apse is very similar to one for the *Palazzetto*: the design of the structure and the shape of the prefabricated units are almost identical. Other examples are the non-realised preliminary projects for two buildings for the Universal Exhibition in Rome (1942).

(see P. Desideri, PL Nervi jr, G. Positano, *Pier Luigi Nervi*, Serie di Architettura ,vol. 5, (Bologna, 1979) pp.166-73.

<sup>9</sup> The contribution of the architect Marcello Piacentini to the *PalaEUR*, despite being widely accepted, has to be considered a complete historical falsehood.

<sup>10</sup> The particular position of the supporting peripteral columns positioned along the tangent to the curve of the dome, create a horizontal force which provoke a tensile strain in the foundations below.

<sup>11</sup> Comparisons with the other great Roman dome, that of St Peter's, do not stand up. The dome is neither hemispherical nor is its structural arrangement similar to either the Pantheon nor the *Palazzetto*.