

# HOW ACOUSTICAL ENGINEERING COMPELS ARCHITECTS TO CREATIVITY

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## 1 INTRODUCTION

In a recent issue of the French magazine "Technique et Architecture", dedicated to Concert Hall Acoustics and published at the occasion of the selection of the architect for the Philharmonie de Paris<sup>1</sup>, the French architect Christian de Porzamparc, Pritzker Prize 1994 and architect for the Cité de la Musique at La Villette in Paris, is 'revolted':

"For me, one must counter those that say « the acoustic engineers alone make a hall, the architects do the trimmings », since they don't have any idea of space and or its relationship with people. One cannot content oneself with the feeling of metric proximity, which is, of course important, since spatial perception is more complex. Sound is isolated like a specific phenomenon, crucial all by itself. However, in a certain manner, we listen with all our senses. How can we be totally receptive and « alert »? One must think of the feeling of light, lines, masses, the perception of the other listeners, of geometrical shapes and many other things that make architecture.

The strength of the space and of the visible is what prepares one to listen. One is sensitive in a very new manner, since one hears the music, with our amplifiers, the way one wants, in landscapes and in films. In the era of the disk, the concert is not the only means of listening, of understanding music. So it has another challenge that of celebrating living music, in a unique moment, with musicians, and of making the whole audience feels it. From these boxes" - he is referring to his design of the Philharmonie Grande Charlotte in Luxembourg – "you can see everything and the musicians like this proximity with the listeners, slightly above and around them. To see the faces that are listening to them, feel that their work is intended for them, on the right and left; this relation could not be achieved with large stalls."

## 2 THE 'WINEYARD TERRACE' DESIGN

As Porzamparc stresses it in the above interview, design is wrought by merging the forces of Architecture and Acoustical Engineering, and this merging approach is the only one that can foster creativity and lead to innovative solutions for spaces dedicated to Music. Intelligence and creativity becomes intermingled, thus stimulating and enriching each other. The origin of the so-called 'Vineyard Terrace' concept, often referred to simply as 'vineyard design', is a perfect illustration of this complex creation process.

### 2.1 The Berliner Philharmonie

With the Berliner Philharmonie, the vineyard design became the established 'prototype' of an audience surrounding an arena-stage, where Hans Bernhard Scharoun and Lothar Cremer redefined the relationship of proximity and envelopment between listeners and musicians<sup>2</sup>:

“When Hans Scharoun conceived, for the New Berlin Philharmonie, a stage that would be surrounded on all sides by the audience, it was a natural extension of his concept to cover the hall with a dome. But when he was told by his acoustical consultant that such concave ceilings always lead to unfavourable focusing effects, whereas a convex shape would help to make the sound distribution more nearly equal, he decided to provide a ceiling in a shape of a tent.”

Consecutively, and as a result of this research combining architecture and acoustics, the introduction of vineyard terraces with their retaining walls that reflect sound, as well as the audience division in zones of seating more limited than in traditional halls, exceeded its immediate purpose and opened to a new definition of identity for the audience and for the proximity relationship between audience and musicians.

Thus was born a new prototype, beside those already existing like the ‘shoebox’, and the Italian opera house. However, this prototype has its own history and its own future, its own developments in the contemporary architecture. As a matter of fact, its origin lays in the Bauhaus.

## **2.2 The Bauhaus filiation and beyond**

In a congress at the end of the 50s, Erwin Piscator explains the birth of his project of total theatre jointly elaborated with Gropius<sup>3</sup>. Invited by a patron to create a modern theatre in 1926, he proposed as architect Walter Gropius, then Head of the Bauhaus in Dessau; “I had a sufficiently precise idea of a theatre designed like a machine, more exactly like a typewriter, which from Aeschylus or Shakespeare up to Chekhov and Brecht, not forgetting the new documentary plays, could satisfy all the needs.

These designs, lengthily discussed and worked out in the details, gave birth to what one calls the ‘Total Theatre’. In reaction to the still prevailing shape of the court theatre, with its division in orchestra, galleries and boxes, the total theatre tried to introduce a new social and architectonic organization. On the one hand, it tried to maintain the tradition by preserving the three traditional scenes - optical box, proscenium and arena stage - but it left each one or the combination opened to any new possibility, any new need. The theatre could be completely invested by film or projections; one could play around the room; the stalls were built on a turntable that could rotate 180°, which made it possible to obtain an arena theatre.

Worked out in 1927 by Gropius and myself, this project of total theatre is still today the basis of many studies, as the President of the Fine Art Academy in Berlin, Professor Scharoun, told me recently. [...] Some of these studies were even patented. But, as much as I know, none of them was realized, with the exception of the house in which you stand. Nevertheless, I believe that these constructions would revolutionize the theatre as much as the structural modifications, both cultural and social, of our society.”

Beyond the filiation of Scharoun and Cremer’s research with Piscator and Gropius’s, was the idea of a flexible, central stage, and of the democratization of the audience arrangement in its relation to the stage not already initiated by the French architects of the XVIIIth century’s Revolution, Boulée and Ledoux, and their German successors, Schinkel, then Semper, and so on? Still earlier, the same idea can be traced back to some architects of the Italian Renaissance.

## **3 RECENT DEVELOPMENTS**

The recent developments of acoustical science enable us new insight into these empirical researches of the past.

Their questioning opens new perspectives to our sight, our listening and our approach. Induced by the requirements of the acoustic program formulated by the client for the contest of the

Philharmonie de Paris, the architects and the acoustics experts had to develop<sup>1</sup> “an innovative concept at both the acoustical and architectural levels. The client very clearly expresses his will to build an enveloping and flexible room, in particular with regard to the use and the location of the stage, with great proximity between the public and the stage, and strong intimacy between the public and the interpreters.”

Looking at the results of the contest, one can evaluate the influence that the prototype or reference model set by the Berliner Philharmonie, with its spatial and acoustical organization, played on the answers of the various teams.

Various contemporary projects and realisations, like the Copenhagen and Hamburg ones, prove that this influence is not limited to the contest for the Philharmonie de Paris. In what do they represent new contributions to acoustics and to architecture? Are these new contributions likely to modify the prototype?

The presentation will develop on these questions.

## **4 REFERENCES**

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2. L. Cremer, H.A. Muller and T.J. Schultz, Principles and Applications of Room Acoustics: Geometrical, Statistical and Psychological Room Acoustics Vol 1, Spon Press (1982).
3. E. Piscator, La technique nécessité artistique du theatre moderne, in "Le lieu théâtral dans la société moderne", colloque de Royaumont Juin 1961, edited by D. Bablet and J. Jacquot, CNRS, (1963, 1978) – reprinted from 32<sup>nd</sup> Congress of Theatre Technicians, Mannheim (28 July 1959)