Radio France Opens L'Auditorium de la Maison de la Radio

By Dr. Yasuhisa Toyota

Last autumn, on November 14, 2014, a new concert hall opened in Paris, France. During the three months of September to November, four new halls with acoustics designed by Nagata Acoustics opened around the world—one in Shanghai, one in Katowice, Fondation Louis Vuitton in Paris and Radio France's new hall, also in Paris.

Radio France and its Two Orchestras

Radio France—France's public broadcasting organization—is headquartered in Paris. Radio France administers two orchestras, Orchestre National de France and Orchestre Philharmonique de Radio France. Compared with England's BBC and Germany's public radio stations that have regionally-based orchestras, Radio France differs from the organizations in those countries. Instead—quite extraordinarily—Radio France has two orchestras under its auspices, both located in Paris and both full-size orchestras.

Figure 1: Exterior of Radio France (at left) with Eiffel Tower (at right)

No other public broadcasting organization that I know of supports two full orchestras. For example, the Japan Broadcasting Corporation (NHK) supports one orchestra and even the notion that it might be able to support a second orchestra is inconceivable. Radio France's support of two orchestras evidences its deeply engrained commitment and attachment to this music genre.

Orchestre National de France and Orchestre Philharmonique de Radio France are each run by a separate administrative organization and each has its own musicians. Until the opening of the new hall, both orchestras used Radio France's "Studio 104" for their rehearsals, a large studio that accommodates about 300 chairs at Radio France's Paris headquarters' building. Also, until the opening of the new Radio France Concert Hall, the orchestras performed at two separate venues. Orchestre National de France performed at Champs Elysees Theatre and Orchestre Philharmonique performed at Salle Pleyel.

The new Radio France concert hall, named "L'Auditorium de la Maison de la Radio" is located adjacent to Studio 104. The two orchestras will both move their rehearsals and their performances to the newly opened concert hall.

Overview of Project

The Radio France concert hall project began as a 1,500-seat hall. During the design phase, the client added a pipe organ to the requirements. To accommodate the pipe organ without changing the footprint of the room, the seat count needed to be reduced to 1,460 seats.

The local Paris architectural firm Architecture-Studio served as the project architect. Nagata Acoustics participated as the acoustical consultant for the room acoustics of the new hall. The Parisian company Lamoureux Acoustique provided acoustical consulting services for sound isolation and noise control.

A Design with Multiple Balconies

On this project, our room acoustics design work put special attention to two key topics. The first topic involved the constraints of the hall's available space combined with the client's request to be able to seat 1,500 patrons. In order to fit 1,500 audience seats in the square, 40 m. x 40 m. space allotted for the new hall, we knew that we would need multiple balconies. A first aim in connection with the balconies was to minimize the number of seats that would be below the overhang of a balcony, because it is difficult to achieve excellent acoustics under a balcony overhang.

Therefore, we decided to make the balcony depths as shallow as possible. This design decision increased the number of balconies required to meet the desired seat count. At the same time, we also needed to keep in mind how to achieve an overall spatial volume that would produce excellent acoustics and a shape that would efficiently produce abundant and beneficial early sound reflections. We used computer simulation studies to guide us to the best design for all of these requirements.

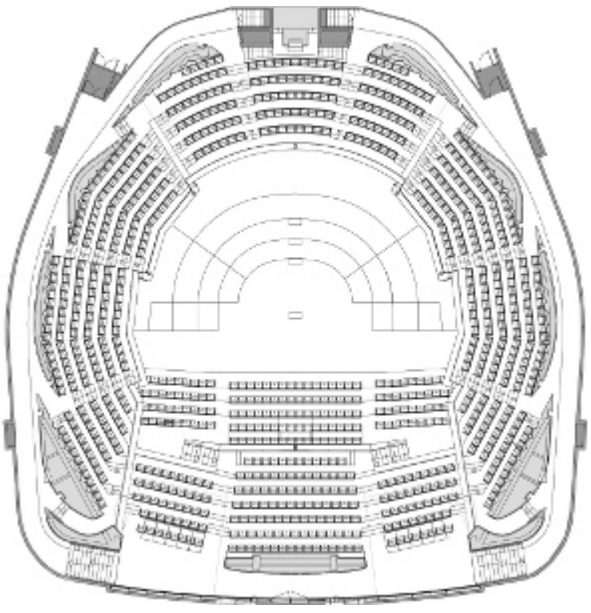

Figure 2: Plan (main floor level)

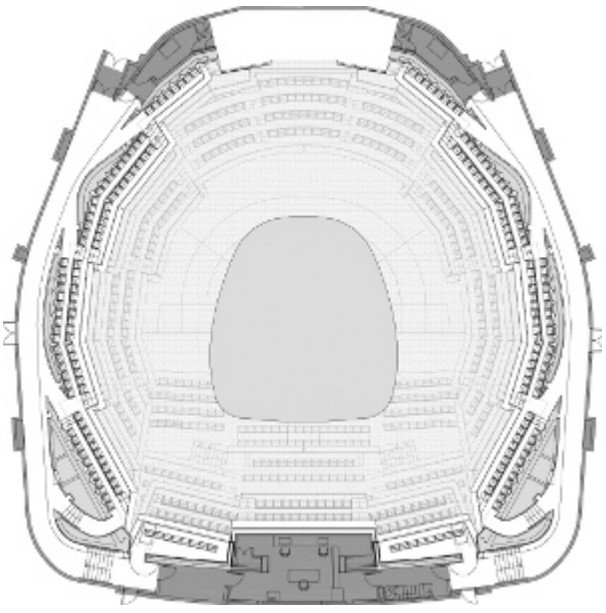

Figure 3: Plan (sound reflector level)

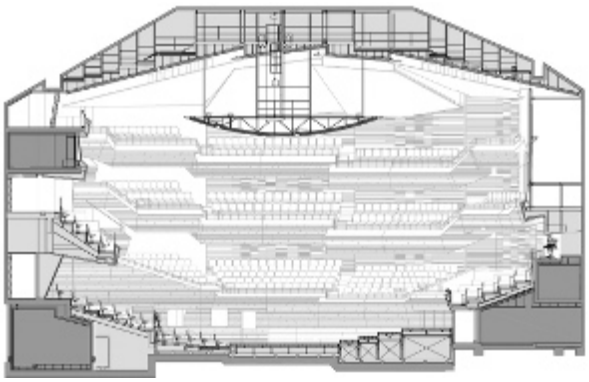

Figure 4: Longitudinal Section

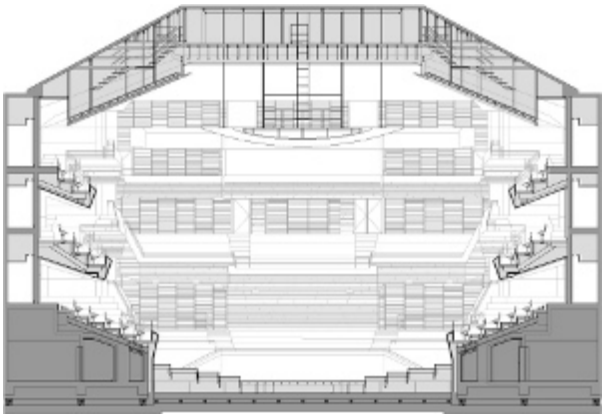

Figure 5: Cross Section

Preventing Echoes

Our second key topic—or challenge—concerned how to prevent the sound reflections generated off the hall's back wall from producing undesirable echoes. Because our design goals included placing the audience seating as close to the stage as possible, we quickly adopted use of an arena configuration for the hall's basic design, with audience seating on all sides of the stage. This configuration also matched the project architect's wishes. As we developed the arena configuration design within the limited overall footprint, the hall's outline took on a circular shape, which, from the acoustical perspective is unfortunately a shape prone to echoes.

Computer simulation studies alone are not a sufficient tool for ensuring the complete elimination of echoes. The best way to detect echoes before building a hall is the somewhat costly method of building and testing in a 1/10 scale model. In the case of the Radio France hall, with its round configuration, use of a 1/10 scale model was an essential step in our design process.

One effective strategy that we implement when working with a fundamentally concave round shape is to add small convex cylinders on top of the concave shape. In addition to eliminating undesired sound focusing of sound reflections generated off the concave surfaces, this design improves the balance and distribution of the sound reflections throughout the hall. We implemented this strategy in L'Auditorium and tweaked it based on testing in the 1/10 scale model. As a result, we effectively eliminated all possibility of echoes and created a smooth and balanced sound reflection distribution throughout the audience seating areas.

Post Completion Findings

We measured the completed hall's reverberation time to be 2.0 seconds (at 500 Hz, in an empty hall). Based on this value, the calculated reverberation time when the hall has a full audience is 1.8 seconds (also at 500 Hz). The hall has a total spatial volume of approx. 14,500 m^3.

The orchestras held their first rehearsals in the hall one week before the hall's opening, with one orchestra taking the stage after the other's rehearsal finished. I had the pleasure of hearing the hall produce acoustics that gave clarity to each instrument's sound as well as rich overall acoustics. In particular, I found that the soft and very soft

piano and pianissimo dynamics waft beautifully through the space.

Figure 6: L'Auditorium (side view)

Figure 7: L'Auditorium interior (view from chorus' seating section)

During the first rehearsal, the fortissimo sounds came across very forcefully. Because the audience seating is truly close to the stage, at this first rehearsal the fortissimo sounds seemed to predominate. Early in each orchestra's rehearsal, there was a bit of a tendency to crank out the louder portions of the music. This kind of straining is typical of how orchestras play in many halls, and unnecessary in a hall such as the new Radio France L'Auditorium that has sensitive acoustics.

Invariably, it takes some amount of time for orchestra players to feel truly at ease in their new home and to learn to relax a bit and trust the hall's acoustics. I am always asked how long the "breaking in" period of a new hall lasts. There's no clear standard or single answer to that question. Nevertheless, as a rule of thumb, I advise clients that it's a good idea to allow two to three months for the musicians to get to know their new hall. Based on the reviews after the L'Auditorium inaugural performances, Radio France's two orchestras redefined what it means to be a "quick study" and both orchestras are already well on their way to perfecting their performances in the new hall.