Successful Experimentation:
Philharmonie Hall, Berlin, 1963

With breakthroughs in acoustic architectural science by Beranek and others shortly after World War II, some architects believed they could design acoustically successful concert halls that would break down traditional conventions. At the time, most acousticians had become disenchanted with fan and horseshoe shaped halls because of their concave back walls and had returned to the belief that the shoebox shape provided the most reliable acoustic results. Still, many architects using the modernist vocabulary believed that the typical musician-conductor-audience relationship was unnatural, forcing a directionality and hierarchy onto the musical performance and the social experience of concerts. German architect Hans Scharoun (1893-1972) stood at the forefront of that movement with his controversial yet revered Philharmonie Hall in Berlin.

Scharoun had gained his reputation in the 1920s when he was one of the most notable figures in architectural expressionism.¹ The rise in rationalism and the advent of war in 1939 limited his practice for many years, and by the end of the war, he was forgotten outside of Germany. After the war, he was asked to serve as Berlin City Architect, but political and economic pressures restricted him from building anything.

Although he left the position shortly thereafter, the appointment expanded his scale of thinking to entire towns.² During the 1940s and 50s, Scharoun focused his attention on entering building design competitions, but with the depressed state of the country, even those he won were rarely built.

Scharoun had designed two unrealized theaters in the 1920s, but his real focus on music halls did not begin until his postwar period. In 1949, he entered competitions to design an opera house at Leipzig and won the competition for the Liederhalle in Stuttgart, but his plans were not used.³ He won a 1952 competition for the Kassel Theater with landscape architect Herman Mattern and acoustician Wilhelm Huller. That commission developed in detail over the following two years before the project was ended. The time spent on the theater was not in vain, because the project provided an ample opportunity for him to develop his ideas of surround and terraced seating. Had the Kassel project been completed, it would have probably brought the same acclaim the concert hall would bring ten years later. By 1956, he was confident in his innovative seating strategies and incorporated them into his designs for an assembly hall at the Geschwister School.⁴

In 1956, the Berlin Philharmonic Orchestra was eighty years old. During its existence had never had its own concert hall. The building the orchestra had regularly performed in before the war had been heavily bombed, but even repairs were out of the questions since it was located in East Berlin. Since the war, the orchestra had been

² Jones, op. cit., p. 14
³ Architects A. Abel and R. Gutbrod with acousticians Lothar Cremer, H. Mueller, and L. Keidel completed the hall with derivative plans in 1956. Scharoun’s 1949 plans were for a 3,400-seat main hall, a 1,000-seat chamber and recital hall, and three smaller recital rooms called Beethovensaal, Mozartsaal, and Schillersaal. Although these halls were planned to be fan shaped (it seemed, unlike his later projects, that acoustics did not play an important role in these plans), there are hints of the Philharmonie with plans for about 600 seats behind the orchestra and balcony seating with rows of seats angled differently from each other.
⁴ Jones, op. cit., pp. 142-149
performing in the auditorium at the Academy of Music, but that space was too small. That year, the city of Berlin sponsored an architectural competition for a concert hall for the orchestra.\(^5\) The conditions were to design a 2,000-person hall with good acoustics on an odd triangular site in the center of West Berlin adjacent to an old school building. In fact, the competition asked that access to the hall should be through the Joachimsthaler Gymnasium.\(^6\)

![Figure 4.1: Model of Scharoun's winning design- note the entrance through the gymnasium](image)

Scharoun, with the help of Mattern and the noted German acoustician Lothar Cremer, submitted the winning design (figure 4.1). The most salient feature of the design was the unconventional layout that put the orchestra in the center of a valley with the

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audience, contained in “vineyard” terraces, cascading down the hall’s hills that surrounded the stage. One of the competition judges said:

Of all the designs submitted, one seems to stand out above all others; which is founded on the principle that the performers should be in the middle. This project seems fortunate on several grounds... but most impressive of all is the complete concentration of the listener on the musical event.\footnote{Herbert von Karajan, \textit{Bauwelt} no.4, 1967, p. 76-80. Translated by and quoted from Jones, op. cit., p. 177}

The design was unique and fresh compared to the other traditional hierarchical concert hall designs, and the people of Germany were eager to venture outside the realm of tradition.

In 1959 with Scharoun’s approval, the city of West Berlin changed the site for the Philharmonie. After anti-Communist riots had broken out in East Berlin in June 1953, the schism between the two halves of the city grew greater, especially with the Soviet plans to complete the Berlin Wall in August 1961 that would separate it from the western part of the city. Fearing that the area near the wall would remain a wasteland, the city fathers moved the site to fringe of the Tiergarten. Construction began in 1960, and when the hall was completed three years later, it stood only 150 yards from the Berlin Wall.\footnote{Lanier, op. cit., p. 99}

Scharoun did make minor alterations to his plans when the site was moved. He had designed the hall from the inside out, and his concept for the building stemmed more from the functional and esthetic qualities of the hall than the site or its surroundings. As a result, the entrance to the hall, originally planned through the gymnasium, remained offset from the hall’s axis. Without the other building, the entrance then used an expressive awning that opened up to the public, inviting them inside (figure 4.4). The inside-out planning is also visible through the notable visual juxtaposition of the taller
hall against the lower, more rectilinear, administrative and circulatory parts of the building. Within the administrative part of the building is a chorus rehearsal room, adding another strange element to the building’s visual tension. All of these elements are reflections of the tensions and juxtapositions within the hall itself.

Scharoun’s concept of the surround seating arrangement, which stemmed from the building’s architectural function as home to the concert event, was the cornerstone of the entire building. Selling seats behind the orchestra was not a new idea, as many halls sold tickets for the chorus chairs when they had instrumental concerts. Still, no one had tried putting one-tenth of a hall’s seats behind the orchestra and another tenth on either

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9 Posener, op. cit., p. 213
side. In this case, the 2,325-person hall had about 250 seats behind and 300 on each side, more seats than even the largest choruses could claim. He had two main goals with the surround hall arrangement. First, he wanted to create a more intimate space, where each audience member could feel closer to the musicians than in traditional halls. The intimacy came from physical proximity, the farthest seat being only thirty-two meters from the podium, as well as a breakdown of the musician-conductor-audience barrier by seating people so they looked into the conductor’s face, or sat over the shoulder of the bass section. The arrangement allowed everyone to feel more connected with the music. “Can it be an accident,” he asked rhetorically, “that whenever improvised music is heard, people tend to gather around the performance in a circle?” Second, he wanted to encourage the community aspect of concert-going. With surround seating, the audience looked at itself as much as it looked at the orchestra. He described this as “producer and consumer” not facing each other, but rather the community of listeners encompasses the performers. With such a clear concept for the interior of the hall, he could readily design for the rest of the building in relation to it.

Scharoun worked in cooperation with Cremer from the beginning, and in fact, Cremer was initially suspect of the architect’s surround concept. He warned Scharoun of potential acoustic blend and directional instrument problems that could arise from the seating arrangement. Scharoun stood firmly by his concept, but agreed to accommodate Cremer in every other way. Cremer recalled the relationship as a fruitful partnership, and said that Scharoun was the most accommodating architect he had ever worked with.

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11 Leo Beranek, *Concert and Opera Halls and How They Sound* (1996), p. 245  
12 Scharoun in Pfankuch, 1974, p. 279. Translated by and quoted from Jones, op. cit., p. 179  
always able to fulfill his demands without violating his own architectural desires. Scharoun’s attention to Cremer’s recommendations is in some ways responsible for the hall’s visual and structural complexity.

One of the major factors in the hall’s complexity was the terraced seating arrangement. Once Scharoun had convinced Cremer to allow the surround seating, the acoustician became most concerned about making the acoustic conditions on stage similar to those in other halls. To do that on the 300 square meter stage, he made sure that tall surfaces, up to three meters, surrounded most of the stage to reflect sound back at the ensemble. These surfaces made it such that the audience would need to sit above them to have direct sight lines into the orchestra. From this layout, Scharoun began to see his hall as a landscape: a valley with the orchestra at the bottom and surrounded by rising “vineyard” terraces. The hall contained about twelve of these separate vineyard terraces, each one with slightly different viewing angles of the stage. These terraces, often intersecting one another at extreme angles, often had large reflecting surfaces, and because of the intersections, provided a wide variety of reflecting patterns for diffusion around the hall (figure 4.3). The reflecting patterns from the vertical interruptions from the terraces ensure that the early-time-delay-gap would be within about fifty milliseconds even though the hall was unusually wide. The other important acoustic effect from terraced seating was that it helps prevent grazing incidence. The terraces in the Berlin Philharmonie, each with their own front row and the dramatic rakes behind, give clear view of the stage and allowed for unobstructed direct sound.

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14 From Jones’ personal conversations with Cremer, Jones, op. cit., p. 182
17 Michael Forsyth, Buildings for Music (Cambridge, MA, 1985), p. 303
Another important acoustic factor that proved disorienting was the shape of the hall. The walls of the hall, although nearly completely hidden behind the terraced seating, played a role in sound reflection. The irregular geometric shape eliminated parallel surfaces, and even those that seemed parallel, such as the walls of the hall in front of and behind the orchestra, were angled in section so not to produce resonances.

The most salient feature of the hall was the tent-like ceiling (figure 4.4). In order to achieve the desired reverberation time in the hall, Cremer had calculated that he needed to allow eleven cubic meters for each audience member. In order to provide adequate reflections to the seats far from the orchestra, he wanted to have low ceilings around the walls. However, he knew that a flat ceiling with his desired height at the walls would not have provided enough volume to the hall, and he knew that there would be terrible acoustic consequences if he used a concave dome. With the help of Scharoun and doubtless the influence of architect and tensile structure advocate Frei Otto, Cremer
decided to employ a tent-like roof structure that was convex in every section.\textsuperscript{18} This shape further aided diffusion within the hall.

![Figure 4.4: Tent ceiling as seen from outside. Note the built main entrance that was one of the few changes that resulted from the site change.](image)

Cremer included a few other acoustic control measures into the Berlin Philharmonie. Although he had provided the reflection walls around the orchestra, he was still worried about sound that would reflect off the high ceiling above the orchestra and come back as an echo. To reduce the risk, he installed ceiling clouds much like those in Beranek’s Philharmonic Hall. With dimensions of about three-meters on each side, these panels would not reflect bass frequencies.\textsuperscript{19} Cremer was confident that they would be effective because they were double curved and properly spaced, again adding to the hall’s diffusion. By his calculations, bass reverberation was actually going to be too great in the hall with so many other large reflecting surfaces. To ensure that the hall did not have a booming sound, Cremer added 136 pyramidal diffusers with slits in them to act as

\begin{footnotes}
\item[18] Jones, op. cit., p. 183
\item[19] Lanier, op. cit., pp. 99-100
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low-frequency-absorbing Helmholtz resonators to the ceiling, and he used thin wood paneling over airspaces on the walls to further dampen the bass response.\textsuperscript{20} Those additions limited the hall’s low frequency reverberation time, but still left enough bass to allow a warm sound in the hall with a 2.0 second reverberation time in the middle frequencies that rose to 2.2 seconds down around 125 Hz.\textsuperscript{21} With the Philharmonie located under the flight path of Templehof Airport, sonic isolation was another important acoustic consideration. Cremer advised that the roof of the hall have the outside layer and the hall ceiling separated by twenty feet and an intermediate soundproofing ceiling. The side walls also contained sound blocking airspaces to further the protection from outside noise.

The hall’s complexity served an architectural purpose as well as acoustic. With the common availability of phonographs, Scharoun needed to differentiate the concert experience from the home listening experience. The best way to do that was by putting the listeners in as close contact with the performance as possible, and by creating a visually spectacular and intimate setting, he could provide a visual contact that was not available from records.\textsuperscript{22} Each terrace slopes in both planes, so hardly any surfaces in the entire hall were horizontal or vertical. Aside from creating an exhilarating visual experience, Scharoun believed those juxtapositions would have four important psychological effects. First, they articulated multiple viewpoints of the performance rather than the lone standard viewpoint in traditional halls. Next, they leave an ambiguity in the focal point rather than focusing it on the conductor. Third, the seats sometimes faced other audience members as much as they face the orchestra, thus reinforcing his

\textsuperscript{20} Beranek, op. cit., pp. 245, 248
\textsuperscript{21} Barron, loc. cit.
\textsuperscript{22} Forsyth, op. cit., p. 300
emphasis on community. Finally, the terraces provided convenient circulation pathways with each terrace having its own exit. The landscape layout of the hall removed normal perspective clues from the hall, making accurate perception of its size and shape difficult and different from every other seat in the house.

The building’s visual interest did not come without cost: Berlin Philharmonic was one of the most difficult works of architecture ever realized. Otto described the hall as “the room of a thousand angles that is impossible to visualize as a unity and is difficult to follow on plan.” The construction crews required a section every two meters in order to align accurately the barrage of complicated intersections and overlaps. When costs needed to be cut, changes were made to cosmetic rather than acoustic details. Some compared the complex design to a realized version of Renaissance Italian Piranesi’s concept of continuous and interminable space.

Opening night in October 1963 was a trial by acoustics with many critics prepared to write negative reviews for the risky design. One such critic was New Yorker travel writer and skilled violinist Joseph Wechsberg. He reported that he began to be won over as he went up the twisting stairways from the lobby, and by the end of the evening he was overwhelmed by Scharoun’s magnificent vision of the audience around the music and the landscape around the audience while the warm and lyrical music poured over him. French composer Pierre Boulez was excited to begin exploiting the possibilities within a

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23 Jones, op. cit., p. 179
25 Posener, op. cit., p. 207
26 Jones, op. cit., p. 186
27 One such detail is the hall’s signature gold exterior. The original plans called for the building to be wrapped in copper, but cost cuts required the building use painted concrete. After several years, and with Scharoun’s approval, gold anodized aluminum cladding replaced the painted concrete; however, a translucent outer coating to soften the material’s brightness was never added. Jones, op. cit., p. 188
28 Posener, loc. cit.
29 Lanier, op. cit., p. 102
surround hall, and he credited the Philharmonie, saying it that was “the only hall I know which is conceived on different terms.”

Luciano Berio called the hall “a milestone in musical architecture.”

The hall’s powerful appearance and intimate feel convinced most skeptics of the merits of Scharoun’s and Cremer’s innovative design.

Figure 4.5: View of orchestra from audience- note how the audience members face one another

Many reviewers saw Scharoun’s building as a final gesture towards expressionism. In several accounts, critics have compared the hall to Robert Weine’s 1920 expressionist film, Das Cabinet des Dr. Caligari. The two share many notable qualities associated with genre, including an emphasis on setting that compresses an

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30 Pierre Boulez on a BBC radio interview in 1970, quoted from Jones, op. cit., p. 221
31 Jones, loc. cit.
32 Forsyth, op. cit., p. 303; Posener, op. cit., p. 207
entire universe into an enclosed space, and the architectural abstraction of natural forms, such as Scharoun’s vineyard terraces and landscape.\footnote{An articulation of the elements in expressionism from Werner Sudendorf, “Expressionism in Film: The Testament of Dr. Caligari,” \textit{Expressionism Reassessed}, ed. Sulamith Behr (1993), pp. 93, 96}

Nearly all accounts praised the hall for its evocative setting and quality acoustics, but some did recognize that the surround layout was imperfect. One critic remarked:

When I have listened to concerts in the building, I have had acoustically perfect seats: the sound was strong and rich, rather too strong; but listeners in seats immediately above the orchestra have complained that the group of instruments nearest them dominated the sound.\footnote{Posener, op. cit., p. 208}

Cremer too realized the imperfection, but he had made such thorough efforts to diffuse sound by other means that the dominance of the instrument group nearest the listener did not mask the rest of the ensemble; in fact, the dominance of close instruments, if the listener was in one of the front rows, provided a natural acoustic feel to the otherwise diffusing space. The more troublesome problem to Cremer was that a group of instruments closest to the listener could be weaker than the rest of the ensemble because of directional properties of certain instruments. He noted that on the side of the hall behind the first violins, the shoulders and bodies of the musicians shadowed the sound of the violins, and that the sound of the cellos was weak behind the stage for the same reason.\footnote{Lothar Cremer, “Early lateral reflections on some modern concert halls,” \textit{Journal of the Acoustical Society of America} 85 (March 1989), p. 1214}

However, for most listeners the ability to watch the conductor’s face and gestures more than compensated for these “small acoustic imperfections.”\footnote{Loc. cit.} Despite any imperfections, the hall was seen as Scharoun’s greatest architectural achievement.
Today, the Berlin Philharmonie stands in what is known as the Kulturforum district near several other architectural landmarks. One of the most striking nearby buildings is Mies van der Rohe’s National Gallery, built close enough to the hall to invite comparisons between the Gallery’s high-modern architecture and the Philharmonie’s expressionism, the most strongly opposed types of architecture from the mid-twentieth century.37 Other nearby buildings share many qualities with the concert hall, including Scharoun’s designs for the Chamber Music Hall, the Museum of Musical Instruments, and the Institute for Musical Research building, all completed posthumously.

Most musicians and acousticians still appreciate the Berlin Philharmonie’s unique acoustics and layout. In a survey conducted in 1990-92, musicians rated the hall, on

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37 Posener, op. cit., p. 213
average, as excellent; however, individual opinions varied from “great acoustics and
great sight lines,” to, “Terrible sound. Mozart sounds lost while Beethoven is at home.”

Even though the hall was built before acousticians recognized the importance of lateral
reflections, some seats have quite good lateral reflections, but even for those seats that do
not, warm, diffused reverberation within the hall compensate for them.

The successful experimentation in Scharoun’s Berlin Philharmonie led to a long
line of halls incorporating either terraced seating, surround seating, or both: Böttcher Hall
in Denver (1971), the concert hall at the Sidney Opera House (1973), the Vredenburg
Music Center in Utrecht (1977), the Tonhalle in Düsseldorf (1978), the Louise M. Davies

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38 Beranek, op. cit., p. 586
39 Barron, op. cit., p. 98
Symphony Hall in San Francisco (1980)\textsuperscript{40}, the Gewandhaus in Leipzig (1981), the St. David’s Hall in Cardiff (1982), the Roy Thompson Hall in Toronto (1982), and the Royal Concert Hall in Nottingham (1982), the Suntory Hall in Tokyo (1987), and the still unfinished Disney Concert Hall by Frank Gehry. Once Scharoun and Cremer had succeeded in breaking down the conservative barriers of tradition in concert hall design, they cleared the way for further experimentation in unique acoustic architecture.

\textsuperscript{40} Louise M. Davies Hall in San Francisco opened in 1980 and surprised everyone with detrimental and unanticipated echoes from the rear wall back toward the stage area. In 1991, Kirkegaard came to fix the echoes, reduce the reverb time from 2.18 seconds to 1.90 seconds, improve the ensemble and increase the feeling of intimacy in the hall. Leo Beranek, the original acoustic consultant for the hall, says that the renovation marks significant improvements in architectural acoustic science since 1975 when he designed the space. These improvements include the use of multiple hanging panels, a now-frequent feature in concert halls, as well as the quadratic residue diffusers to eliminate the echo. The Davies Hall renovations made one of the worst sounding halls one of the best in the world.