Proceedings of the Institute of Acoustics

REFLECTIONS ON AN IDEAL: TRADITION AND CHANGE AT THE GROSSER MUSIKVEREINSSAAL, VIENNA

PA Clements Jaffe Holden Scarbrough Acoustics, Inc., Norwalk, Connecticut, USA

1. INTRODUCTION

The legacy of twentieth-century auditorium design leans heavily on the legacy of the great nineteenth century concert halls. Of these, the Grosser Musikvereinssaal in Vienna, with its resident orchestra, the Vienna Philharmonic Orchestra, perhaps most closely continues to embody the ideal concert hall sound against which acoustic excellence is judged.

The impetus for this paper came from the author's discovery, in the Archives of the Bau Polizei in Vienna, of a reasonably complete series of architectural drawings of the building, beginning with the initial plans of 1864 and continuing through many renovations until 1957. Photographs in the Archives of the Gesellschaft der Musikfreunde in Vienna added helpful information.

This research revealed that the Grosser Musikvereinssaal, which appeared to be almost an immutable model, had in fact undergone many renovations since it opened in 1870, including a major renovation in 1911 which resulted in significant changes to the hall's architecture. Further research into the music in the hall between 1870 and 1911 revealed a parallel change and some remarkable interrelationships between the hall and the development of the repertoire, orchestra and performance practice.

The purpose of this paper is to share some of the findings of this research and then to reflect on how this information might influence our thinking about this most studied of acoustical models.

2. THE CHANGING MODEL I: THE HALL

2.1 Background

The Musikvereinsgebaude - literally the "Music Society Building" - was designed by the architect Theophil Hansen for the Gesellschaft der Musikfruende in Wien (Society of the Friends of Music). The Gesellschaft had been founded in 1812 to promote an "ever-higher perfection" in music through public concerts given by its orchestra of amateur and professional musicians, and its Singverein (choral association). In 1817 it founded the Vienna Conservatory to further these aims through musical training.[1] Though not the first concert-giving organization in Vienna, it was the first with such a serious and lofty purpose.[2]

The new building replaced the earlier Gesellschaft building whose 600-seat concert hall had become too small. The building was conceived and built in the era of the grand redevelopment of Vienna after the 1848 revolution, when the perimeter walls of the old city were demolished, making way for monumental buildings on and adjacent to the Ringstrasse. In keeping with the grandeur of its context and the Romantic musical ideals of the period, the building is in Italian Renaissance style with some Greek stylistic elements.

The building contained a large and small concert hall (the Grosser Saal and Kleiner Saal), accommodation for the Vienna Music Conservatory, offices and other facilities for the Gesellschaft, and spaces for rent to other musical organizations. Bösendorfer and other instrument makers were located there. The Vienna Philharmonic Orchestra also moved its offices into the building, and since then has rented the Grosser Saal for its concerts.

2.2 The Grosser Musikvereinssaal

The Grosser Saal at the Musikverein is a classic "shoebox" concert hall in form - rectangular and narrow, with one balcony, flat ceiling modulated by beams and mouldings, and highly articulated surfaces everywhere. The platform has adjustable risers that vary the platform area and configuration. Gilded caryatids line the side walls and decorate the organ case, and the ceiling and other surfaces are elaborately decorated and gilded. The room is known as the "Goldener Saal" for this decoration and because of the "golden tones" of music in the room.[3]

Currently the room seats around 1600 people when the extended stage is used, but the numbers vary somewhat because of standing room at the rear of the main floor and seating at the rear corners of the platform when the orchestra size permits. The measured reverberation time is around 3.05 seconds at mid-frequencies (unoccupied) and 2.0 seconds at mid-frequencies (occupied). Beranek gives a long list of measured acoustical characteristics.[4]

Since the opening concert in 1870, the room has undergone many changes, including the installation of four different organs (in 1872, 1907, 1939 and 1968), repairs of fire damage in 1870 and 1885, installation of electric lighting in 1895, a major renovation in 1911, repair of bomb damage after World War II, rebuilding of the platform several times, replacement of the chairs, general maintenance and restoration, and installation of air conditioning in 1995.

2.3 Renovations prior to 1911

The most commonly given reason for the 1911 renovations is fire safety. Fire had been a concern from the beginning: during the night after the concert given by Clara Schumann to open the Small Hall (only two weeks after the Large Hall opened), fire broke out in the cloakroom, apparently as a result of over-heating. The beams in the cloakroom ceiling beneath the Large Hall were severely burned, and the walls and ceiling of the Large Hall were damaged by smoke.

In 1881 a fire in the Vienna Ringtheater resulted in much loss of life, and this prompted serious thinking in the Gesellschaft about how to improve fire safety in the Musikverein building. In 1885, during a masked ball, fire broke out in the ceiling of the Large Hall. However, it was contained and the public was able to leave without panic or injury. In 1895 electric light was installed, an 1903 the large wooden beams of the Small Hall were replaced with iron beams as a fire safety measure.[5]

Two organs were installed in the Large Hall between 1870 and 1911. The inaugural concert for the first organ took place on 15 November 1872, with Bruckner at the organ and Brahms conducting. The Leidegast organ had been planned from the beginning, and the original plans and early photos show the balcony rails terminating on either side of the organ case. When the organ was installed, the balcony was extended in front of the organ to connect both sides of the room.

By 1907, musical demands had changed to such an extent that a larger organ, more suited to solo performances, was installed. The Rieger organ was built into the existing organ case, and the old pipes were retained as decorative, non-speaking pipes. The console was moved from the stage level to the balcony, and the centre of the balcony was reconfigured to accommodate it.

2.4 The Renovation of 1911

When the major fire-safety renovation was done in 1911, the opportunity was seized to improve facilities for the growing audience, and also to modify the Large Hall in response to the changed requirements of the modern concert, repertoire and orchestra. Figures 1 and 2 show plans of the room before and after the renovation.*

The interior of the Large Hall was almost completely gutted. The side balconies were rebuilt using iron beams, so that they now cantilevered freely into the room. This enabled the caryatids that had formerly supported the balconies, together with their substantial pedestals and the deep beams above their heads, to be relocated against the side walls. The enormous light fixtures at the balcony rails were removed, and the balcony and parterre rails were reconstructed to eliminate the pedestals that formerly had supported the lights and caryatids.

Steps were added to elevate the rear rows of side balcony seats and improve sightlines. Alternate doors along the side balconies were closed off so that the seating could be rearranged to facilitate exiting and add extra seats. Iron beams were used to cantilever the front section of the rear balcony forward into the room, thereby gaining two additional rows of seats. On the main floor, seats were rearranged to improve egress at the cross-aisle and several rows of seats were planned close to the orchestra platform. It seems likely that the seats in the upper rear balcony were unchanged, since early descriptions of the rear balcony describe an "amphitheatre" (suggesting a steep rake). By this author's estimate almost 150 seats were added to the room.

Text descriptions and photographs show that the original orchestra platform comprised a series of sliding sections that could store away to make a narrow podium with steep stairs, or extend and layer forward for orchestral performances (as shown in Figure 1). In 1911 this stage was enlarged and the risers were reconfigured. With the caryatids now against the side walls, the parterres at the sides of the platform could be eliminated, increasing the usable area for the orchestra by about 45%. The original flooring and wooden supports were re-used. The wood used originally, and in all renovations of the stage since is a local, soft black pine (*Schwarzföhre*) of not particularly fine quality.

A surviving photograph of the renovation shows other structural changes - installation of iron lintels above the side doors, for example, scaffolding for work on the ceiling, and a pool of water on the floor. It seems possible that the roof was rebuilt or modified at this time. A wooden beam and truss construction for the roof is shown in the 1864 drawings. However, as now built the main roof trusses are of iron, with secondary beams of wood. It is not clear whether the roof was built like this initially or modified later.

The ceiling itself is an unusual construction - the gilded decoration is applied to plaster over a system of wooden beams and panels that are suspended on cables from the roof trusses. Above this wooden construction there is now a layer of white, dusty sand about 3" thick, and on top of this are flat terracotta bricks approx. 1" thick. The whole system is designed so that the ceiling load is carried by the trusses and does not bear on the side walls. It is believed by some that this construction is part of the secret of the Grosser Musikvereinssaal's acoustical excellence, the theory being that the construction allows the ceiling to vibrate in response to the music. It is far more likely, however, that the mass provided by the sand and bricks reduces low-frequency absorption by what would otherwise be a highly absorptive wooden ceiling construction. The 1864 drawings suggest that the sand and brick construction was there from the beginning. Were the iron trusses installed at this time also? Since the roof of the Small Hall was rebuilt with iron beams in 1903, it is possible that the same treatment was applied to the large hall a few years later. The change also may have occurred when the roof was rebuilt after bomb damage at the end of World War II.

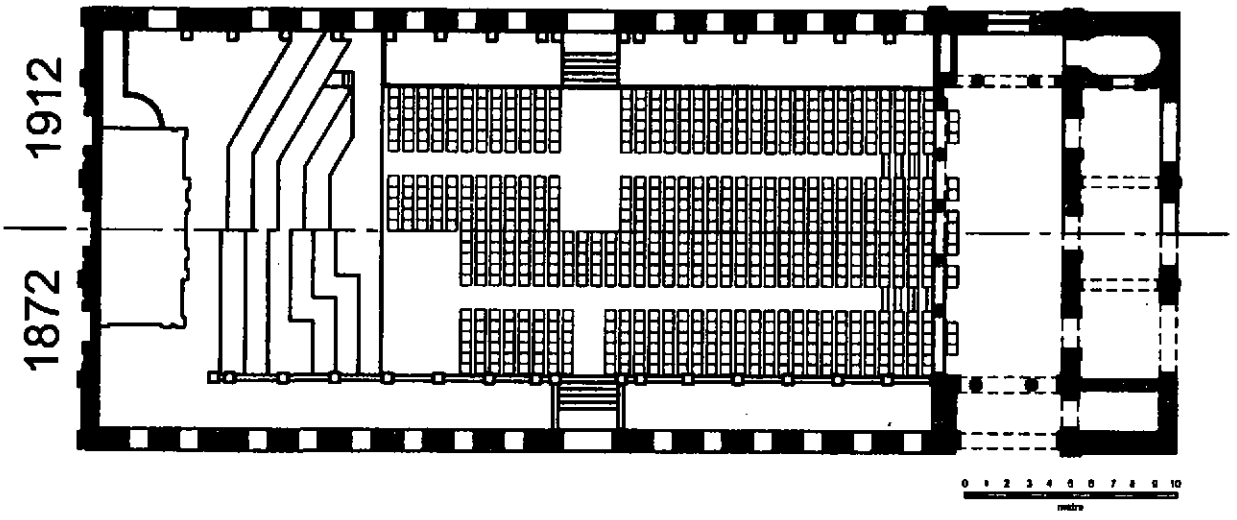


FIG. 1 GROSSER MUSIKVEREINSSAAL, VIENNA
Level 1, ca. 1872 and 1912

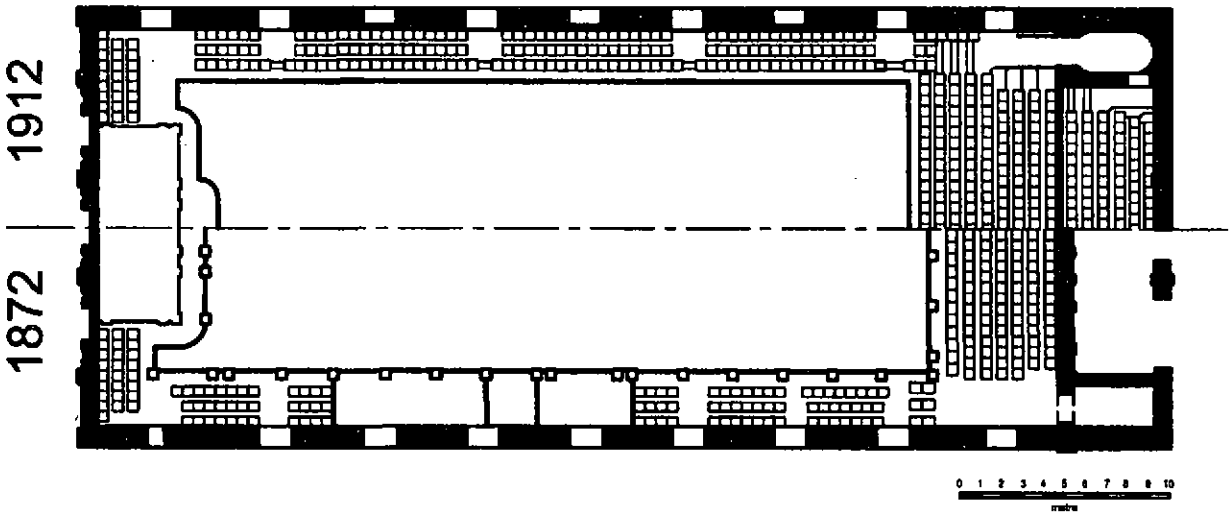


FIG. 2 GROSSER MUSIKVEREINSSAAL, VIENNA
Balcony Level, ca. 1872 and 1912

* Since no "as-built" plans were found for either 1870 or 1911, Figures 1 and 2 are composites, derived from the surviving 1864, 1890, 1911 and 1938-39 plans. The "ca. 1872" version was chosen to represent the original design, since it shows the organ. The "ca. 1912" plan is based on the 1911 drawings showing proposed changes to the hall. Some of the details in both plans have been adjusted using later plans, text descriptions and photographs. The 1872 riser layout was derived from an early photograph. The caryatid layout at the stage comes from plans dating to

1938-39, but it is likely that this is how it was built in 1911. The seating plans for the main level are derived from 1890 and 1911 drawings, plus later photographs; no seating is shown at the parterre because no definitive plan was located. All of the parterre and main level seats were removable for balls and other events.

In the rest of the building, the main oval staircases were replaced with wide straight stairs, the Kaiser's private staircase (which interrupted access along the corridors at the western balcony) was removed, other staircases were improved, and exits were added or changed. New entries were added at the front of the building, and a large access "tunnel" was added right through the building at the ground floor level (running underneath the Large Hall). The cloakrooms were enlarged and ancillary spaces were upgraded.

2.5 The acoustical significance of the renovation

Michael Barron has noted the paucity of comment about the acoustical excellence of the Grosser Musikvereinssaal until this century.[6] One's first thought on discovering the extent of the 1911 renovations is to wonder whether the hall's acoustical reputation could belong to the post-1911 hall and not to its earlier form. However, there is evidence that the hall was regarded as acoustically excellent right from the beginning, and that the acoustics were considered to have survived the renovation without harm.

The concert program that opened the hall on 6 January 1870 was chosen both to celebrate the occasion and to test the acoustics. Johann Herbeck was the conductor, with the Gesellschaft Orchestra (including members of the Vienna Philharmonic Orchestra) and the Gesellschaft Singverein. The program was:

Beethoven	Egmont Overture
Haydn	Chorus "Stimmt an die Saiten" from the "Creation"
Bach Seb.	Adagio (Violin: Hellmesberger)
Mozart	Aria from "Entführung aus dem Serail" (Herr Walter)
Schubert	"Der Friede sei mit Euch"
Beethoven	Symphony in C minor (No. 5)[7]

Franz Grasberger and Lothar Knessl in their book *Hundert Jahre Goldener Saal* report that people found that the acoustics were excellent in all respects (though not saying what these were), and quote the *Blätem der Erinnerung* : "As large as the hall is, even in the furthest corner one is able to discern the fastest figures with utter clarity and exact ending. Nowhere is there the slightest echo. Human voices as well as the string and wind instruments take on a soft, caressing tone, yet are distinct and clear, sparkling. Every timbre stands out and has its own noble character."[8] Kralik reports that the Vienna Philharmonic Orchestra must have been pleased to leave the Kärntnertor Theatre, the opera theatre where they previously gave concerts, "because for symphonic music the acoustics there were not the best - they were regarded as especially clear and pure but the forte sound was considerably dampened".[9] Taken together, these comments suggest that the acoustics of the original Grosser Saal were both clear and reverberant, with a distinct expression of instrumental colour. These are the defining characteristics of the hall today.

Since the best possible architect had been chosen for the design, it was to some degree taken for granted in Vienna that the hall would be excellent acoustically. Once proved, the acoustics were highly valued but not much commented on. The focus of Gesellschaft and the Vienna Philharmonic Orchestra was then and continues to be on the music and the performance. Such was the focus also of Edouard Hanslick, whose music criticism spans fifty years of concerts in Vienna, many of them in this hall.

There seems to have been great trepidation in undertaking the renovation of the Grosser Saal, for fear that the fine acoustics would be affected. Reports from the time suggest that even the moving back of the caryatids "was looked upon with fear", and the wood from the orchestra platform was reused in order to "preserve the fine acoustics".[10]

The hall reopened on 17 October 1911, with another program chosen to celebrate the hall and test the acoustics.[11] Fritz Steinback was the conductor. The works chosen for this task were:

Beethoven	Violin Concerto
Beethoven	Symphony No. 9

The outcome of this acoustical test was that the public judged the sound "still to be ideal".[12]

Looking at the great physical changes to the room we would now consider that the space was likely to have changed acoustically as the result of the renovations - for the better. The freeing up of the space under the side balconies not only changed the pattern of reflections from the side walls and the underbalcony soffits, thus changing the arrival time of early reflections and the pattern of scattering around the caryatids, it could be argued that it effectively added the volume under the balconies (approximately 8% of the room volume) back into the room. The much larger stage area could now accommodate a symphony orchestra of over 100 players. This would have allowed programming of modern works with augmented brass and percussion, and hence different orchestral balances. The new riser configuration would have improved ensemble playing; the under-balcony reflections are likely to have aided on-stage hearing. The rear balcony soffit extension would have added some useful reflections back to the centre of the audience, and was narrow and high enough not to form an acoustical shadow over the seats below. On the detrimental side, the increased audience size and the loss of the open, reflective floor area between the platform and the first rows of seats, would have increased mid and high frequency absorption in the room. But this change may be more in theory than in fact: early illustrations show the hall very crowded with standees, so the total audience numbers may not have changed much.

On balance, the renovation of 1911 would seem to have changed or even improved aspects of the room's acoustical character. Why then was the change not commented upon at the time? Was it perceived? The room is remarkably beautiful, and this colours (golden), the phycho-acoustic response to the room. The renovation was done by Ludwig Richter, a former student of Theophil Hansen. This association would have encouraged trust in a good outcome. The musicians performing were of the highest calibre, and familiar with the acoustical characteristics of the room prior to renovation. Beethoven's 9th symphony is a wondrously joyful and uplifting work, and very familiar to the musicians and the audience. And, given the predeliction of audiences and musicians to experience changed acoustics as necessarily a change for the worse, perhaps the acoustics needed to have been significantly improved in order to be thought not to have changed at all.

3. THE CHANGING MODEL 2: THE MUSIC

3.1 Background

The Vienna Philharmonic Orchestra is an association of members of the Vienna State Opera (the Hofoper at that time). It was formed in 1842 to raise money for the musicians' pension fund, and initially held only a few concerts per year. The orchestra barely survived the 1848 revolution, but in the 1860s it was reinvigorated and entered a period of strength and artistic excellence. Its subscription concerts began in 1860; after 1870 it gave eight subscription concerts per year, plus a few festive concerts.

While the Vienna Philharmonic Orchestra concerts were built around symphonies and concertos, the Gesellschaft concerts were strongly oriented towards vocal music, with oratorios, masses, lieder, and choral works far outnumbering symphonic works. It was not until after 1900, when the Wiener Konzertverein Orchestra (which eventually became the Vienna Symphony Orchestra) was founded, that the Gesellschaft concerts changed to focus primarily on symphonic music.

The Grosser Musikvereinssaal was also home to many other types of performances and events. The Family Strauss gave popular promenade concerts in the hall for over twenty years; drinks were served to the crowd sitting at tables. There were formal balls, masked balls, pageants, commemorative events, opera performances by students of the Conservatory, student performances, choral concerts, poetry and prose readings, and "first-artist" evenings, in which a performance was followed by dancing. Today, the hall is almost constantly in use, with orchestras from all over the world added to the list of performers.

3.2 The composers

The Musikverein is unique among concert halls in its close association with the development of the Western symphony concert tradition. Consider: when the hall opened, Beethoven, Haydn, Schubert, and Mozart formed the core of the programs. By 1912, with the centenary celebration of the founding of the Gesellschaft, they had been joined by Brahms, Bruckner, Goldmark, Mahler and Richard Strauss. Of all these composers, only Goldmark is no longer represented in the "standard" concert repertoire. All were Vienna natives or lived there for important periods of their musical lives.

Brahms and Bruckner were closely associated with the Musikverein from its beginning. Bruckner was a teacher of organ and theory at the Conservatory. Brahms was conductor of the Gesellschaft Orchestra between 1872 and 1874. They both conducted their own works in the Grosser Saal, and many of their works were first performed there. Both initially had works performed at Gesellschaft concerts: for Brahms with his lieder and choral works and for Bruckner with his masses and choral works. In 1876, both Brahms and Bruckner conducted their own symphonies (both in C minor) in the Grosser Saal, performed by the Gesellschaft Orchestra. In the 1880s Brahms's symphonies were readily performed by the Vienna Philharmonic Orchestra, but Bruckner's symphonies were more controversial, and initially the Philharmonic elected not to perform his second or third symphony. By the end of the 1880s and the 1890s, however, symphonies of both Bruckner and Brahms were being performed by the Vienna Philharmonic - in the Goldener Saal.

Mahler had been a student at the Vienna Conservatory in the 1870s, and returned to Vienna in 1897 to become conductor of the Vienna Hofoper. He became conductor of the Vienna Philharmonic Orchestra in 1898, and held both posts until 1907, when bitterly conservative and antisemitic attacks finally forced him to resign. Controversy raged over his conducting style, his symphonies, and changes he made to the orchestration of some of Beethoven's works. He conducted the Vienna Philharmonic in performances of his second, third and fourth symphonies in the Grosser Saal, but took his later works elsewhere (to larger venues).

Because the "standard" concert hall repertoire has become so universal, it is easy to underestimate the importance of the Grosser Saal as a partner in the musical development of the late nineteenth century. Brahms, Bruckner and (to a different degree) Mahler all listened to and worked with the sound of music in this hall for so many years that it can be argued that the sound that they were writing for was the sound of the Grosser Saal.[13] At the very least, the hall would have been a generative model for an imagined ideal sound.

This connection between the acoustic qualities of a particular hall and composers who wrote for it, or whose musical imaginations were influenced by it, is probably the most direct connection between composer and hall since Bach was writing for Thomaskirche in Leipzig or Handel for the Great Hall at Esterháza. Add to this the importance of the music of Brahms, Bruckner and Mahler in the present-day symphonic repertoire, and the influence of the sound of the Grosser Saal as an acoustical model can be seen as remarkable.

3.3 The Orchestra

In the 1870s the Gesellschaft orchestra probably numbered around 60 players, depending upon the works performed, and it seems that it may have remained relatively small - perhaps because it was not a permanent orchestra, perhaps because of its focus on choral music. A photograph dating to around the turn of the century still shows an orchestra of this size.[14] The Strauss family orchestra also numbered around 60 players in 1870.[15]

The Vienna Philharmonic Orchestra, on the other hand, began to grow in size relatively early. Photographs of the orchestra show 78 members in 1864, 100 in 1885 and 114 in 1910.[16] The Grove Dictionary of 1878-1889 gave the string section alone as 67 players. However, these figures are misleading because not all members of the orchestra played in every performance, and prior to the 1911 renovation it would have been virtually impossible for all these musicians to cram onto the platform.

Illustrations of the opening Gesellschaft concert show the chorus standing in front of the orchestra - the practice of the time. Photographs from the 1890s show choral risers behind the orchestra. In the early years, and certainly for choral concerts, the Gesellschaft orchestra probably stood to play. The Vienna Philharmonic Orchestra was probably seated: it is thought that it was the first concert orchestra to perform seated.[17]

The sound quality of the Vienna Philharmonic Orchestra, the "Vienna sound", is legendary. This sound has to do with instruments in all sections of the orchestra that are unique to Vienna, in particular the Vienna horn, oboe and timpani. Nikolaus Harnoncourt describes the Vienna horn as "almost gleaming", the Vienna oboe as "pure and abundant".[18] All of the instruments have playing techniques specific to Vienna, which have been handed down for generations through training at the Vienna Conservatory and within the orchestra itself. This line stretches back directly to musicians who knew and worked with Beethoven, Mozart, Haydn, and Schubert, and hence the Vienna Philharmonic Orchestra has a special feeling for and understanding of their works. Added to this is the orchestra's independence as a self-governing group of musicians, that influences its dedicated approach to music and its own performance style.[19]

Although the musical instruments were developing throughout the nineteenth century (and into the twentieth),[20] the greatest change was in the woodwinds and brass in the last quarter of the century, just when these instruments were gaining new roles in an ever enlarging orchestra. The enthusiasm for exploring the musical possibilities of large orchestras, begun by Berlioz and furthered by Wagner, was taken up in Vienna by Bruckner, Mahler, and Richard Strauss, all of whom were experimenting with writing for enormous forces using the new and improved instruments. At the same time, it was becoming the norm for late-nineteenth-century conductors to use large orchestral forces to perform works by earlier composers. This is the context for the controversy over Mahler's rescoring of Beethoven.

A curious aspect of this great period of musical change is that it took place in the early configuration of the Grosser Saal, with its restricted orchestra platform. It would take the 1911 renovation, before these late Romantic developments could be fully realized in the room.

3.4 The Sound of the Room

While in Vienna, the author listened to many concerts in the Grosser Musikvereinssaal, by several different orchestras playing a range of works from the Classic through to late twentieth century periods. These musical experiences ranged from sublime to disappointing. It was a revelation to discover that this wonderful hall is easy to overplay by an orchestra unaccustomed to its musical demands, and to hear the resulting sound - harsh, unbalanced and overbearingly loud. Such a sound in any other hall would be regarded as a severe acoustical detriment. The hall calls for a "little fantasy" in performance, but can be dangerous because the acoustic response is such that it is easy to become imprecise.[21] Yet, when the orchestra, repertoire and performance practice are perfectly accommodated to the hall's acoustics, the musical experience is sublime.

Such is the sound of the Vienna Philharmonic Orchestra playing in this room. The orchestra takes a chamber-music approach to performance, listening to and working with each other and constantly shaping their sound in response to each other and to the room. The strings allow their sound to resonate, their articulation is soft, attacks are not too direct, phrasing has a strong sense of the overarching line, playing is legato, with an imperceptible change of bow. They play together at any price, even if the rhythm yields a little. When the lower strings play in their highest registers, the aim is to allow their tone colour to shine through rather than blending with the higher strings. The woodwinds play without vibrato, working rather with the special palette of tone colors of each of the instruments. An ideal of the Vienna horn sound is to begin so gently that the attack is not audible and the listener is unaware of when the sound really begins. Horns and trumpets blend into the string sound, yet their overtones are rich and distinct. The timpani has a sound that is never "ordinary", even in a full fortissimo. Especially in antiphonal sections, and when different instruments are in dialogue, one can hear the players shaping and responding each others' instrumental colours. The sound is simultaneously blended and distinct. Even when the brass play fortissimo the string sound is full. And the fortissimos are vast and tremendously loud, yet rather than assaulting they are deep and richly coloured. Other words used to describe the sound include: silky, resonant, sweet, melded, luminous, delicate, even texture, breathless intensity . . . .[22]

Nikolaus Harnoncourt states that the Vienna sound developed in the period between 1860 and 1920 and became "the ideal instrument for the music of that age".[23] For virtually all of this time the Grosser Musikvereinssaal, with its distinctive acoustical character, provided the context for this development, and it must therefore be seen as a defining element in shaping the Vienna sound. Room and music are inextricably linked.

4. REFLECTIONS ON THE MODEL

What is this most influential of acoustical models? From all of the above, one could argue that the model is not the 1870 hall, but the 1911 version, with the Vienna Philharmonic Orchestra playing a repertoire dominated by late Classical and Romantic works by Austrian and German composers. Or one could argue that the model is the Grosser Muskivereinssaal that we experience, physically and musically, today; a model only somewhat changed from the 1911 version. In this sense, it is a wholly contemporary model.

What does this model offer for acousticians as we seek to learn from and evolve beyond it? Knowing that the hall's acoustical excellence was able to support the music and allow it to flourish through a period of enormous change can give us courage as we wonder what direction music will be taking fifty years from now. Knowing that the conservative impulse of a great musical tradition was also able (if gradually) to incorporate the radical and new can help us treasure our musical inheritance even as we open up to new directions.

Since the model contains both music and acoustics, it suggests that there is more work to be done in exploring the interrelationships between music and acoustics. This may be fertile ground in our search for a deeper understanding of acoustical excellence, and for additional measurable parameters. The Grosser Musikvereinssaal may be the ideal location for this research, because the Vienna Philharmonic Orchestra is so finely aware of responding to the acoustic conditions, and because without such adjustments the sound of music in the hall can be far from ideal.

What lies ahead? Not literal imitation of this concert hall (even if it were possible), but a greater level of acoustic understanding that will open up possibilites for new geometries, new materials, new music. The Grosser Muskivereinssaal offers a guiding principle as we push the limits: when orchestra and music are perfectly accommodated to the hall's acoustical character, the musical experience is sublime. It is this ideal of the sublime that we carry with us into the next century.

---

[1] Major references for this paper were: For the Vienna Philharmonic Orchestra - Heinrich Kralik, *Das Grosse Orchester: Die Wiener Philharmoniker und ihre Dirigenten,* Vienna: Wilhelm Frick Verlag. n.d.; Clemens Hellsberg , *Demokratie der Könige: Die Geschichte der Wiener Philharmoniker,* Vienna: Kremayr & Scheriau, 1992; and Herta and Kurt Blaukopf, *Die Wiener Philharmoniker: Wesen, Werden, Wirken eines grossen Orchesters.,* Vienna: Paul Zsolnay, 1986. For the Gesellschaft - Franz Endler, ed., *Der Wiener Musikverein,* Vienna: Edition Wien, 1988; Franz Grasberger and Lothar Knessl, *Hundert Jahre Goldener Saal: Das Haus der Gesellschaft der Musikfreunde am Karlsplatz,* Vienna: Gesellschaft der Musikfreunde in Wien, n.d.; Richard von Perger and Robert Hirschfeld, *Geschichte der K.K. Gesellschaft der Musikfreunde in Wien,* 2 vols, Vienna: Gesellschaft der Musikfreunde in Wien, 1912; and Eva Angyan, Otto Biba and Manfred Wagner, *Goldene Klänge: Künstler im Musikverein,* Vienna: Gesellschaft der Musikfreunde in Wien, Adolf Holzhausens, 1995.

[2] Mary Sue Morrow, *Concert Life in Haydn's Vienna: Aspects of a Developing Musical and Social Institution,* Stuyvesant, NY: Pendragon Press, 1989, p. 63.

[3] *Hundert Jahre.*

[4] Leo Beranek, *Concert and Opera Halls: How they Sound.* Woodbury, NY: Acoustical Society of America, p. 600.

[5] "Iron" rather than "steel" is the term used in the source documents.

[6] Michael Barron, *Auditorium Acoustics and Architectural Design,* London: E & FN Spon, 1993, p. 71.

[7] Concert programs are listed in *Hundert Jahre.*

[8] *Hundert Jahre.*

[9] Kralik, p. 31.

[10] *Hundert Jahre.*

[11] Interview with Dr Otto Biba, Archivist of the Gesellschaft.

[12] *Hundert Jahre.*

[13] C. Floros, "Brahms, Bruckner and the Vienna Philharmonic", in *Klang und Komponist: Ein Symposion der Wiener Philharmoniker.* Congress papers published by Hans Schneider, Tutzing, 1992. Floros makes this observation in relation to Brahms and Bruckner. This collection contains many useful papers on the Viennese instruments and performance practice. See papers by Dolezal, Horvath, Nagy, Plangovsky, and Schuster.

[14] *Hundert Jahre.*

[15] Endler, p.238.

[16] Blaukopf, pp. 11, 23, 173.

[17] According to Hans von Bülow.

[18] Nikolaus Harnoncourt, "Die klangliche Identität eines Orchesters", from *Klang und Komonist.*

[19] Hellsberg, *Demokratie.*

[20] The change from gut to steel strings occurred gradually between 1920 and 1960 (Harnoncourt).

[21] Interview with Dr Clemens Hellsberg, President of the Vienna Philharmonic Orchestra.

[22] *Klang und Komponist,* and notes taken during performances in the Grosser Saal.

[23] Harnoncourt, "klangliche Identität", p.64.

Proceedings of the Institute of Acoustics

TWENTIETH CENTURY MUSIC SPACES --TO LOOK AT OR TO LISTEN IN? THE STRUGGLE OF THE AURAL OVER THE VISUAL

Anne Minors Anne Minors Performance Consultants, London, UK

The subtitle for this paper emanates from my experience as an architect and theatre consultant in designing concert halls with architects who are highly articulate visually, but do not always have a feel for the aural environment, and my observations that what excites architects visually is often at odds with acoustical excellence.

As most concert hall commissions in Europe still arise out of an architectural competition, the urban response and external architectural form are key to the design, usually well developed and difficult to alter in the design phase in comparison to the acoustics.

The first half of the paper will be a quick resume of key halls set in their political and social context. It looks at the main changes in concert hall design and whether these were acoustically, architecturally or scenically led. It also examines if, in this strongly visual world, the caretakers of the aural environment are successful in emphasising the aural needs to architects while musicians demand ever better international facilities from their experience on tour.

The second half will look at the programming of halls in the second half of this century arising from the development of the music and broadcasting industry; the advent of the multi-purpose room and the challenges that flexibility poses for architect and acoustician together.

1 HISTORICAL PERSPECTIVE

Firstly let us revise some political, musical and architectural history.

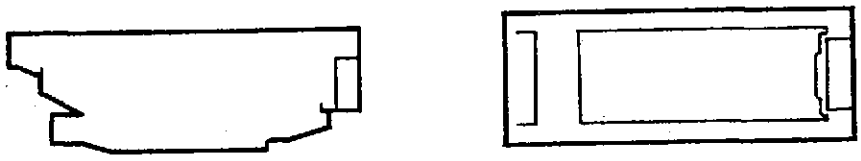
Politically, the 20th century divides into two halves, the first half being preoccupied by war, the second by maintaining peace.

At the turn of the century the Western world seemed to be entering a period of increased personal comfort and international harmony with many inventions. The confidence of society allowed composers to challenge some of the tenets of the musical language which had been accepted for at least two centuries. Ambiguity and instability came to be expressed as well as the exotic and idiosyncratic. Universal language of music gave way to the expressions of individualism. Mahler, Smetana and Debussy demonstrated different approaches to combining sounds which emphasised emotional contrast, incorporated folk tradition or created impressionistic sound images. Schoenberg was developing his atonal music or 'emancipation of dissonance' by 1910. Stravinsky's premiere of the Rite of Spring took place in 1913 at the Garnier Opera House in Paris, causing riots for its rejection of harmonic progression and unprecedented rhythms and blocks of sound.

Architecture was not so progressive. Architecture often lags behind artistic endeavour because of the time and number of people involved in physically building the idea. Up to the First World War concert halls in the West demonstrated an accepted universal language of classical proportions and architectural orders. Between 1870 and 1900, 12 concert halls were built in Europe and America, 8 of which were and are highly regarded for their acoustical

NINETEENTH CENTURY MUSIC SPACES - ACOUSTIC REFERENCE

Vienna
Musikvereinssaal
1870



seating capacity 1680

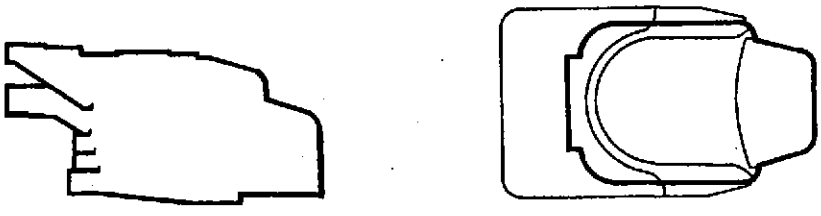
Leipzig
Neues Gewandhaus
1884

seating capacity 1560

Amsterdam
Concertgebouw
1888

seating capacity 2037

Carnegie Hall
New York
1891



seating capacity 2804

Queen's Hall
London
1890

seating capacity 2026

Boston
Symphony Hall
1900

seating capacity 2625

excellence and appropriateness for classical music from the Baroque period up to the Romantics. They are Vienna Musikvereinssaal; Leipzig Neues Gewandhaus; St Andrew's Hall, Glasgow; Amsterdam Concertgebouw; Carnegie Hall New York; Queen's Hall London; Boston Symphony Hall where Sabine developed his work on reverberation time which was to influence the design of concert hall acoustics for the next half century.

Five of these are shoebox forms whereas both Carnegie Hall and the Queen's Hall have a squarer plan form making use of concentric balcony fronts with convex surfaces near to the stage.

World War I demonstrated the double edged sword of technological invention that could be put to use both for Man's benefit and his destruction. In Europe the post war mood was one of modesty and sobriety with immediate concerns with rebuilding rather than achieving an utopian state. In America the post war years were filled with optimism and desire for change up until the Wall Street crash of 1929.

2 BETWEEN THE WARS

Architecturally and artistically several movements arose after the Great War combining architects, painters and sculpters and their influence on the architectural community continues to this day. Di Stijl in the Netherlands was founded in 1917; Walter Gropius founded the Bauhaus in Weimar and in France, Le Corbusier and Ozenfant published a review L'Esprit Nouveau which nurtured the new architecture that became the International Style. The Modern Movement in architecture, dismissed decoration as superfluous, believed that the plan was primary and that form follows function. Both of these declarations may have been reasonable for housing, but for concert halls these premises caused a number of difficulties.

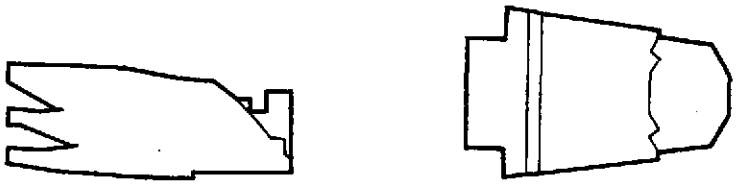
In the 21 years between the two World Wars, few concert halls were built. The seven listed in Leo Baranek's book have some similarities in proportion – a low wide plan and continuous surface to the ceiling supposedly reflecting sound directly to the audience. Their common architectural vocabulary is the simplicity of line, the large areas of smooth, curving surfaces but within this there is a wide variation in style. Acoustically they were all based on the premise of good direct sound to the audience and appropriate reverberation time. Their reputations vary with their visual appeal as much as their acoustic success or otherwise.

The Salle Pleyel was the first hall based mainly on new acoustic theory having a ceiling of near parabolic sections with flat untreated splayed walls to the sides to supposedly reinforce the direct sound. This was not successful, although a fire one year later offered an opportunity to improve things. Since then the Salle Pleyel has undergone three further changes but the degree of improvement has been limited to the materials and surface shapes and major changes to the basic form have not been possible.

The Palais de Beaux Arts in Belgium is rather more popular with performers and audience, being a flattened oval plan with multiple curving horizontal balconies and a sweeping, visually unifying, coffered ceiling.

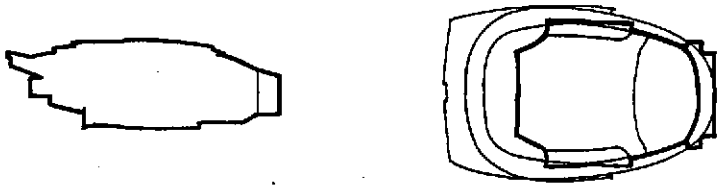
The antithesis of the visual movement in Brussels is the cool, clean-lined unified space of the Konserthus in Gothenburg. It has a simple raised section of seating around the stalls following the staggered line of the walls and thus seating only 1300 people in a plan area and volume that in other halls contained 1800 –2000seats. At this stage in acoustic development, Sabine's equation for calculating RT formed the basis of all designs. The form of the volume was not yet thought important. Gothenburg was the first space to introduce a canopy over the orchestra, and this was reshaped to be convex, improving the balance and ensemble.

Salle Pléyel
Paris
1927



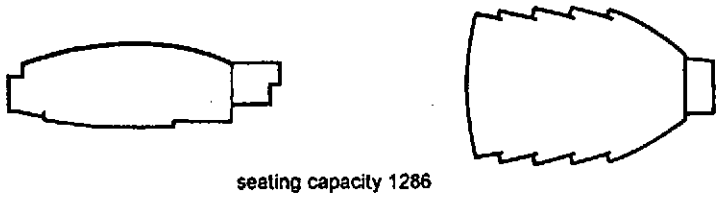
seating capacity 2386

Brusseis
Palais des Beaux Arts
1929



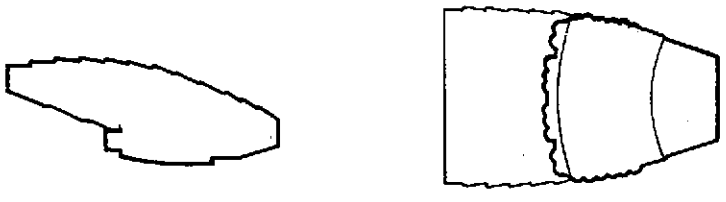
seating capacity 2150

Gothenburg
Concerthouse
1935



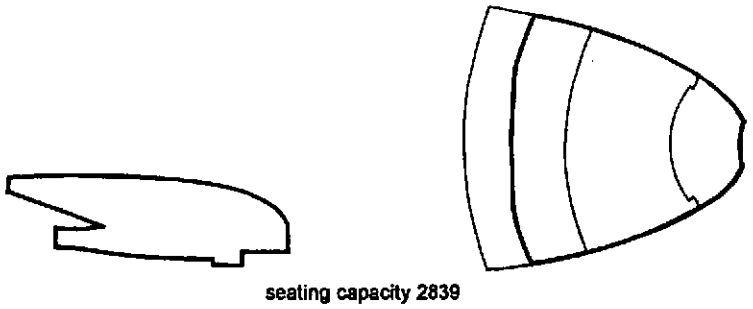
seating capacity 1286

Liverpool
Philharmonic Hall
1939



seating capacity 1824

Buffalo Kleinhans
1940



seating capacity 2839

Liverpool Philharmonic Hall built in 1939 is warmer in feel than Gothenburg, with some architectural influences from the cinema architecture of the time and with the angled illuminated planes of the side walls. Hope Bagnell was the acoustician with Herbert Rowse as the architect. Having been a listener in this hall over 600 times in my teens and a cellist in the youth orchestra for hundreds of rehearsals, I cannot be dispassionate about this hall, even though its acoustics before its recent alterations did not support the sound of the bass instruments. Along with a lot of naturally over-energetic Merseyside adolescents, I learnt to listen in this hall, and I attribute this in part to the calming nature of the hall and its simple focussed decoration which occupied the eye, leaving the mind free to concentrate on the music.

Buffalo Kleinhans in the USA took the cinema architecture one further with the illuminated side walls extending right into the stage and broadening out into a very wide fan shape, being over four times as wide as its height at the back. This creates a deadness of sound for performers and a lack of liveness for audience although the local population, according to Baranek, finds no fault with the acoustics.
A journalist in Forum magazine waxed extremely lyrical on the aesthetic qualities of Buffalo, again bringing into focus the positive effect on the acoustics that a visually pleasing space can give.

Can we draw any conclusions about the perception of spaces and their success from this period of concert hall design? For the musicians, sounding good to oneself and the audience is of prime importance and therefore acoustically excellent rooms will win hands down, but they also respond to a friendly ambience of a room. For the audience too, halls which offer the right sense of warmth and richness and are comfortable to listen in will be thought to have better acoustics than one which is visually cold or lacking in its sense of community, even if objectively the sound is better in the visually cold room. Thus from the photographs, one could conclude that the audience will like the Brussels hall better than the Salle Pleyel.

3 POST WAR EFFECTS

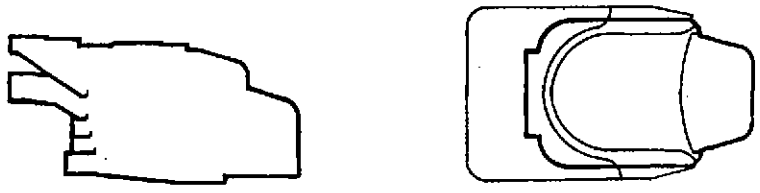
The two world wars deeply affected Europe and Russia, where the heartland of classical music had been. Huge migrations of artists and musicians from Russia and Europe to (mainly) the USA took place, the latter country benefitting from a rich mix of cultures that the musicians brought with them. Those that remained under repressive regimes had their creativity taken off course. Lutoslawski was forced to write folk orientated music so he became a café pianist; Shostakovich wrote in musical code of his life and the repression he felt under the Communists. Those free to express their revulsion of political events wrote very moving music and words and often dissonant works – Vaughan Williams 5th Symphony; War Requiem by Britten with words by Wilfred Owen, Child of our Time by Tippett.

There was a twelve year gap between 1929 and 1951 when no concert halls were built, then three appeared in the same year in London, Manchester and Bristol to celebrate the Festival of Britain as part of the drive for a better future. This was accompanied by the founding of institutions to improve the quality of life for future generations such as in the UK –the BBC; the National Health Service; the Royal Opera and Royal Ballet.

New directions in acoustics based on 50 years of theory were explored by Hope Bagnell; Bill Allen and Peter Parkin in the design of the Festival Hall. They consulted with Bolt, Baranek and Newman. HB wanted to explore the good acoustics of the roman amphitheatre and thought that creating an artificial hillside for the audience to sit on receiving only direct sound from the orchestra would be worth pursuing. He created a small 'lake' of stone finished floor separating the audience from the stage.

TWENTIETH CENTURY MUSIC SPACES 1900-1960

Carnegie Hall
1891



seating capacity 2804

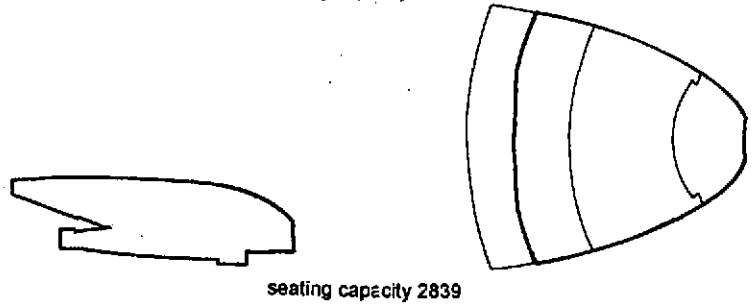
Boston
Symphony Hall
1900

seating capacity 2625

Salle Pléyel
Paris
1927

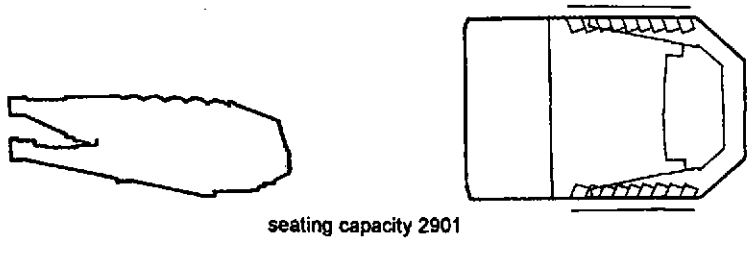
seating capacity 2386

Buffalo
Kleinhans
Music Hall
1940



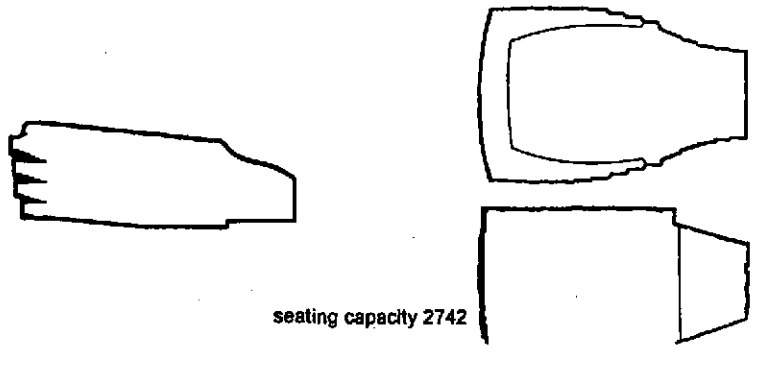
seating capacity 2839

Royal Festival Hall
1951

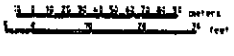


seating capacity 2901

New-York
Philarmonic Hall 1962
Avery Fisher Hall
1976



seating capacity 2742



The acousticians put subjective acoustic criteria at the top of their priorities, noting that the musicians needed to hear each other for ensemble and intonation, and that the audience should hear a similar balance to the conductor wherever they sat. Definition should be clear and the tone should be singing. Parkin and Allen stated that the long section was acoustically the most important part of the design. Reverberation time and clarity were the guiding principles rather than strength of sound as it relates to the size of the audience and the exposure of the audience to the room. Avoidance of echoes led to the angled annexe areas either side of the stage. The provision for Helmholtz resonators to absorb low frequency sound was turned to advantage to extend the reverberance with electronic means. It was recognised that the hall would take occasional performances of ballet for which extra lighting was installed (no mention of sightlines or scenic staging.)

The architectural articles of the day talk of the harmonious relationship between architects and acoustician which resulted in a building which many love to be in and whose classic design of modern lines has withstood and absorbed the changes in visual taste during the last 50 years. Indeed the architecture of the building has won a place for the RFH in more hearts than the acoustics of the room, which are dry and difficult for many performers. A management initiative that broadened the RFH's popularity was the opening up of the foyers to the public for independent use in the 70's.

A more successful acoustic was achieved at Bristol Colston Hall but it was less influential owing to less throughput of artists. Nine more concert halls appeared in Europe, Scandinavia and South America between 1953 and 1960, none particularly revolutionary.

4 NEW SPATIAL EXPERIENCE

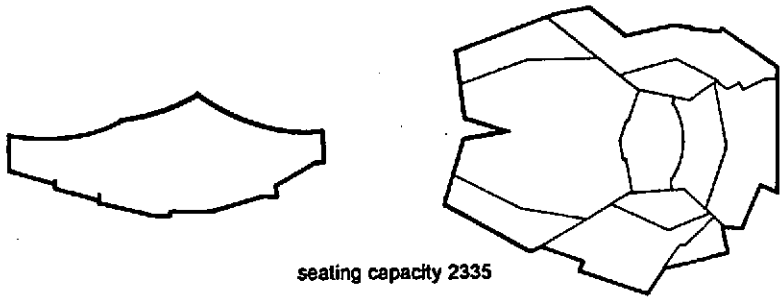
Then in 1956 Hans Scharoun won a limited competition to build the Berlin Philharmonie with a design which took a new and bold approach both to the audience layout and the acoustics. It was completed in 1963. Born in 1893, Scharoun helped to reconstruct East Prussia after the First World War and joined Bruno Taut's expressionist circle of artists and architects, Arbeitsrat fur Kunst. His lifelong commitment to socialism stemmed from this time. However he was denied his natural creative outlets for several decades, being thought degenerate by the Nazis. Abner, writing in 1974 in the Architect observed, "I couldn't help wondering whether those years of enforced fallowness, throughout which he drew and drew to keep sane, did not help to liberate his imagination. His pre-Nazi designs seem infinitely stiffer and duller than the startlingly free concepts of his old age."

Scharoun postulated that placing the orchestra and conductor (in this case Herbert Von Karajan) in the visual centre (although not geometrical centre) of the space would enable the audience to take part directly, creatively in the performance. "The act of music making and the experiencing of music both take place in one and the same place. The conception of the building does not start from an aesthetic formula, but from the event of a concert. Man space music – here they are related to each other in a new way."

The acoustician, Cremer worked closely with the idea of dividing the audience by putting reflective and diffusing surfaces of sufficient scale and complexity between areas of audience. In this case the audience is in effect occupying the whole of the plan area of the hall like vineyard fields which creates a large plan area. Scharoun wanted to place a dome on the space but was persuaded to design a tent shaped ceiling, "allowing the music to rise up from the ground and sink down upon the audience, like rain on the grapes." Pyramidal ceiling reflectors added to the ceiling's complexity. As Scharoun went on to say, "This solution is due to a large extent to preparatory work done by acoustic science which has here broken new ground".

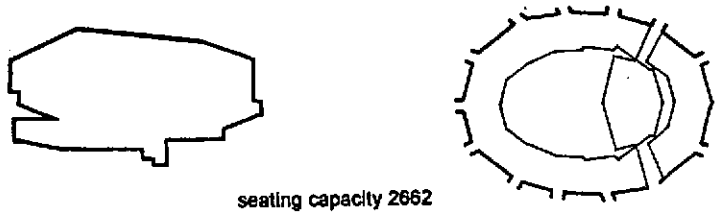
TWENTIETH CENTURY MUSIC SPACES 1960-2000

Berlin
Philarmonie
1963



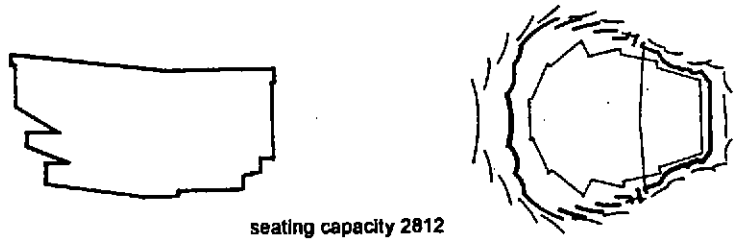
seating capacity 2335

Christchurch
Town Hall
New Zealand
1972



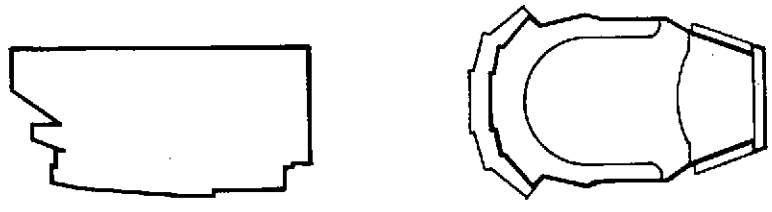
seating capacity 2662

Toronto
Roy Thomson Hall
1982



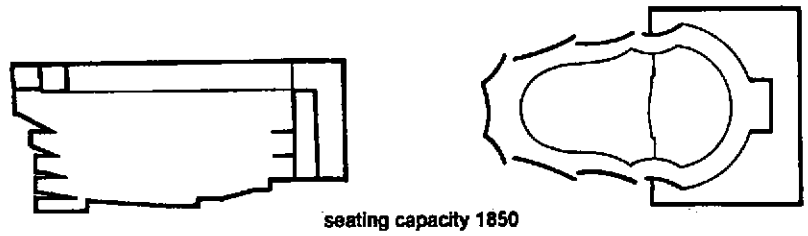
seating capacity 2812

Dallas
Concert Hall
1989

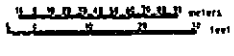


seating capacity 2065

Singapore
Arts Centre
Concert Hall
2001



seating capacity 1850



Some were less convinced about the omnidirectionality of the concept – Abner again "What the classical composers would have made of it we shall never know. Beethoven wrote for an orchestra which faced the audience: from every instrument, and particularly the brass, the sound was directed straight at the listener. He didn't write for people sitting beside the orchestra, still less behind it. The logic of Scharoun's music-in-the round leads us to trumpets, for instance with four bells pointing to all quarters of the compass and to singers with mouths in the back as well as the front of their heads. Alternatively, I suppose it leads us to people like Stockhausen, whose music breaks out like a civil disturbance all over the place."

At the same time as Berlin was being designed in Europe, the New York Philharmonic and Leonard Bernstein were eagerly awaiting the opening of the Philharmonic Hall. The first architect to work on this was Max Abramowitz with acousticians Bolt, Beranek and Newman. The architects advisied a rectangular hall, but the outcome had stepped fanned side walls from the stage and concave steeply swooping side balconies.The results were not encouraging, with echoes, and poor bass register, noisy air supply and draughts. Despite four attempts at improvement, orchestras voted with their feet. The inside was gutted and redesigned in the 70's. By this stage the donors insisted that there could be no more acoustical experiments – sound was to take precedence over style. Cyril Harris led the remodelling basing its principles on the Boston Symphony Hall, an acoustical icon in the home town of BBN. The architects Philip Johnson and John Burgee had to apply their creativity outside the box. There was some recognition in the remodelling brief that the hall would also be used for promenade performances and theatrical events, but special lighting bridges were required to be out of the room for symphony concerts.

An article written before the 1976 opening stated that, "there appear to be no special acoustical difficulties in handling varying sizes and decors in auditoriums when the hard and broken surface rule is applied." The article cited the acoustical success of Orchestra Hall Minneapolis and Orchestra Hall in Washington's Kennedy Centre in spite of being disparate interior concepts although with time the large shoebox format has proved unpopular with musicians and audiences.The same article went on to report the high praise given by the Boston Symphony players after a tour to the Berlin Philharmonie. "The terrace seating, unusual ceiling, unconventional lighting and stage together create a memorable architectural as well as musical experience".

5 BEGINNINGS OF THE AURAL SENSE OF SPACE

On the other side of the world, in New Zealand, Harold Marshall was working on an elliptical concert hall with architects Warren and Mahoney. He focussed the acoustical design goals on envelopment as achieved with lateral reflections, in addition to the already well-appreciated balance between clarity and reverberation.The cross section with the downward angled reflectors was the key to achieving these goals and introduced a development to the design thinking from the importance given to the long section of the Festival Hall. Marshall tested and refined his design by way of an optical ray analysis; a physical scale model and a computer ray tracing programme.The building was also thought a success, fulfilling its function, being economically sound, aesthetically pleasing with a stimulating form, and acoustically excellent with low maintenance costs.

So far all the halls discussed have been primarily single use symphony halls with occasional reference to increased lighting for theatrical events or film. The acoustic remained unaltered. In the middle of the century in Europe, cities usually had a range of single purpose performance spaces for theatre, opera, cinema and concerts. However, with the birth of television in the fifties, the competition for peoples time and attention outside the home was started.

6 INFLUENCE OF MULTI-USE HALLS

A particular American phenomenon was the multi-purpose hall. In the prosperous Sixties, increasing leisure time led to a desire for cultural pursuits outside the main cities. Smaller towns far from the large cities had grown up and wanted to declare their arriviste state by having their own cultural centre. City councils thought this could be achieved by building multi-purpose halls in each community where concerts, musical theatre, dance and opera could be performed. Large seat counts up to 3000-4000 were thought commercially desirable.

Many of these were large fan shaped auditoria with flytower, which were closed down to an orchestra shell for symphony concerts. The acoustical balance for opera and symphony was hard to achieve, being too live for opera and too dead for symphony. Russell Johnson and others worked on the development of smaller volume rectangular auditoria suitable for opera with the use of the flytower volume as a reverberation chamber for symphony. This gave adequate reverberation, but the sound was frontal and lacked envelopment. During the 1970's Syracuse, Thunder Bay and Kitchener were built as new examples of movable architecture to cater for a multi- use acoustic. Chris Jaffe was developing lightweight shells fitting tightly to the proscenium in the 70's and later combined this with the stagehouse reverberation chamber in the 'shaper shell.' Inexpensive off-the-peg acoustical shells appeared in many halls, extending one snapshot of acoustical thought while acousticians moved on.

Artec went on to develop the movable architecture idea to extend the range of acoustics in concert halls, to give the reverberation with clarity that Marshall was also exploring. Myerson Hall in Dallas, designed and built in the 1980's, achieved a good envelopment of sound using the narrow and high parallel walls of the shoebox form with a surrounding reverberation chamber with connecting doors. Birmingham Symphony Hall overlapped in time using similar principles.

In the 1990's, another approach to varying the acoustic volume using moving ceiling sections was built into Lingotto Concert Hall by Arup Acoustics and the Petronas Concert Hall in Kuala Lumpur by Larry Kirkegaard.

7 INCREASING COMPLEXITY OF SPACE AND USE

Economically, the need for multipurpose halls continued to grow during the 80's and 90's particularly in the USA and the UK, where the reluctance of the governments to subsidise the arts became increasingly apparent. It was no longer financially acceptable to have a single purpose facility open only for three nights of the week and for rehearsals – the auditorium had to be filled every night and during the day to bring in the revenue to support the running costs of the large high-energy usage buildings. With the blurring of edges between high art and popular entertainment at least in the venues' location, the preciousness of single purpose rooms became less acceptable.

At the same time the increasing choice available to audiences for entertainment both outside the home and within, meant that the programming had to become more imaginative. Straight concerts with the black and white clad orchestra as the focal point in the room were interspersed with events –semi staged opera; orchestral film tracks played live to film; dancers accompanying the music etc. Apart from the theatrical lighting, scenic effects were sometimes used. More performances were booked that needed amplified sound creating different acoustical problems for fixed single purpose halls for example, over the next two months in Birmingham, there are 15 –23 events per month, 11of which are orchestral concerts; 3 are recitals and the balance (2-8) are popular amplified events. Similarly Bridgewater Hall has between 14 and 26 events per month, 6 –12 orchestral concerts; 5-7 chamber concerts and 3-7 amplified events.

Two charts demonstrate the range of performances over the building type in both the 1950's and 1990's. What is interesting to note is the increased range of events in the concert hall and therefore what the building infrastructure needs to provide. This is partly due to the concert hall booking typically being for single events. Theatres often have long runs of one show, and opera houses are in repertory, so it befalls to the concert hall to take the place of the Victorian Music Hall in providing a variety of events. Of the twelve types of performance identified in the chart for concert halls, six have some visual content and potentially nine uses may require amplification. This shifts the emphasis from the pure concert hall to more multi-purpose uses.

8 HALLS IN THE FUTURE

Flexibility offers another level of challenge to the architect. We have seen examples of rooms which are visually interesting and acoustically poor, or acoustically good and visually disappointing. Very few succeed in both areas with all the users, even when the use is limited to symphony. Add on flexible elements for absorption, diffusion and reflection and another level of understanding of function is required from the architect.

There would seem to be two ways to approach this flexibility in a physical sense. One is to continue along the path of flexible architecture and develop a kit of parts to cater for the acoustic changeability, where the auditorium would work like a machine. This is unlikely to result in high Architecture and may have something of the recording studio aesthetic of IRCAM. The other route introduces electro-acoustics to change the space and offers the architect a chance for a unified appearance which does not change with the apparent size of the aural space. Whether this contradiction in perception between eyes and ears becomes acceptable culturally, only time will tell.

The competition is great for leisure time now, and this has encouraged audiences to become increasingly discerning and to demand the very best experience every time. People are also more mobile and both audience and players are increasingly comparing their facilities with those available abroad. Pressure to build better concert halls often arises after an orchestral tour.

Intriguing architecture, such as the Guggenheim Museum Bilbao and Sydney Opera House becomes a destination in itself. The three dimensional envisioning that CAD offers, allows architects to explore more complex shapes and CADCAM is allowing much more sculptural spaces to be built and than previous building technology would permit. Architectural commentators believe that UK architects are in a baroque phase of Modernism –with more richness of detail than the style in the early days of Modernism. After two decades of reaction against Modern Architecture (and architects) during the Sixties and Seventies, the appreciation of space, for its own sake as distinct from decoration, is finally spreading.

We as consultants on the prime space in performance buildings have to rise to this spatial challenge and be able to respond to the complex geometries in order to keep the architects' interest. As one architect said to me, "I guess making an operating theatre would be a similar challenge to a concert hall – there are so many functional fixes that the design freedom is limited." We need committed and interested architects to take on this challenge – they need our ability to predict and demonstrate acoustical and perceptual consequences of their ideas. Above all respect and nurturing of enthusiam is needed. It saddens me when I hear architects give lectures to other architects about performing arts buildings and they talk with more enthusiasm about the foyer spaces than the performance space, or one finds great details in the foyer and lack of finesse in the concert hall. Both imply that the architects energies were for some reason not engaged in the prime space.

Twentieth Century Music Spaces – The Struggle of the Aural over the Visual A Minors

A major hurdle to educating architects on the aural aspects of halls is the need to experience the space and sound for oneself. Architects anywhere in the world receive visual information on existing halls from glossy photographs in books. They are more influenced by this than by a single visit to an empty concert hall because the only time they can go does not coincide with an appropriate event. Therefore buildings are frequently judged on their visual impression alone. Here are some slides of spaces which fairly universally excite young architects – do they all sound good? How can we bring the musical experience to them?

Likewise musicians need encouragement to develop a visual vocabulary to express what they like about a space. Their experience of a vast range of spaces and their sense of space and its effect on their playing should be invaluable and yet their words are limited to "the use of wood" or just that "the space was nice". Maybe this is telling in itself. Maybe we are being told that an important aspect of a successful hall is not the purity of its architectural vision or just its sound, but that the sharing of the experience, the giving and receiving of the emotional content of the music, the common humanity is what makes an excellent concert hall.