The Design of Wellin Hall

Of Fans and Shoeboxes

by Charles V. Belson

The design of a performance hall is difficult and challenging, especially when excellent acoustics is desired. Wellin Hall was no exception, as Charles V. Belson, the designer of the project for Ewing Cole the Philadelphia firm of architects, here relates. Judicious compromise resulted in what Mr. Belson calls "an unusual hybrid," and a highly successful one at that.

Vincent Scully, Yale's controversial architectural historian, once said that the architectural profession suffers from "physics envy." Based on my recent experience with the design of the Schambach Center, I would say that the symptoms of this malady—which in severe cases includes frequent incantations of the Laws of Physics—is not limited to architects. Acousticians suffer from it as well. Nowhere is this more apparent than in a discussion of the proper shaping of a room for music. Should it be fan- or shoebox-shaped?

The shoebox is the traditional form for rooms for music. Exemplary models frequently cited by contemporary acousticians include Vienna's Musikvereinsaal (1869) and Amsterdam's Concertgebouw (1888). These halls are relatively small—2,000 seats—and acoustically intimate, with most seats fairly close to the orchestra. These rooms have a reverberation time of about two seconds with a full audience. The sidewalls of the rooms and the edges and undersides of the balconies act as acoustical reflectors, creating a rich, full, lateral sound for the listener—the reflected sound complements the sound coming directly from the orchestra. These rooms are also decorated with ornamental plaster which is beautiful and acoustically functional as a dense material that reflects sound well, absorbing little sound energy. Since the plaster designs are also intricately detailed, the reflected sound is well dispersed. There is no focused sound, no echo. The Laws of Physics are obeyed. If acoustics were simply a science with laws to obey, then New York's Philharmonic Hall (a 1962 shoebox with poor acoustics) would not have required rebuilding as Avery Fisher Hall (a 1976 shoebox with better acoustics). Acoustics is as much an art as it is a science.

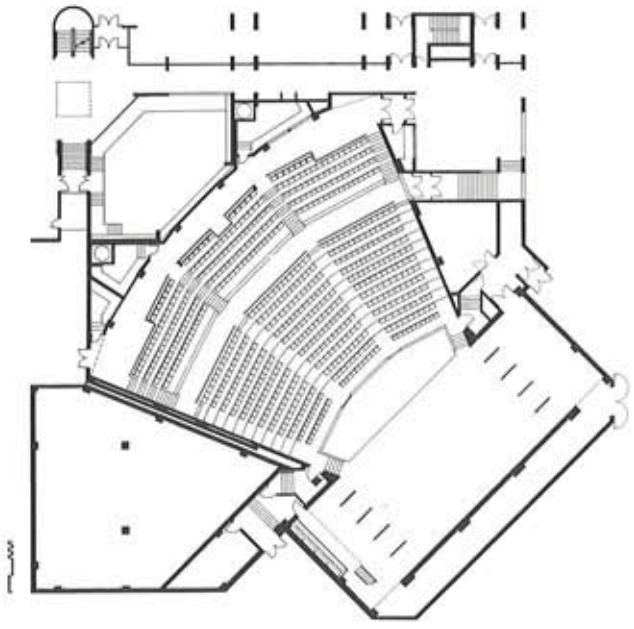
Where both sight and sound are important, designers have experimented with fan-shaped rooms. Wagner's Bayreuth Festspielhaus (1876) was a pioneer that offered good sightlines with seats on a sloping floor (the Musikvereinsaal and the Concertgebouw have flat floors), as well as good acoustics. Unfortunately, many contemporary fan-shaped multipurpose rooms for music, theater and dance suffer acoustically; the sound is perceived as "thin" and "distant," that is, as coming from a single source at the stage or from overhead reflector panels. In a wide 90° fan or even a 60° fan, strong lateral sidewall sound reflections are difficult to achieve since the walls are so far from the center seats. Hence, the "thin" and "distant" sound heard from these locations.

Both sight and sound were important considerations for Hamilton's multipurpose hall. The hall is fan-shaped, but it is a narrow 45° fan similar to Wagner's Festspielhaus. Elaborate projecting sidewall reflectors

are positioned at angles that approximate the sidewalls of a shoebox so that lateral sound reflections at Hamilton are unusually strong. The numerous architectural facets of the rear wall break up and diffuse the sound. Thus, reverberations are strong, but there is no focused sound, no echo. Wellin Hall has a reverberation time that is adjustable through the use of acoustical draperies from 2.3 seconds for organ concerts to 1.3 seconds for plays or lectures. In short, the Schambach Center's Wellin Hall is an unusual hybrid that combines the sightlines of the fan with the sounds of a shoebox.

During the course of the design of Wellin Hall, the pendulum swung from wide fan to shoebox and back to modified fan. A wide-fan, 90°
hall was chosen for its ability to seat up to 1,000 people economically. The concept of a multi-use flexible room was also established at this time with the help of theater consultant John MacFadyen; this included a flat floor with removable seats. As design progressed, acoustician Robert Newman suggested reducing the fan shape from 90° to 60° in order to improve early sidewall sound reflections. Seating was reduced to 700 as a result.

At the same time, Ewing Cole established an overall aesthetic for the proposed building using the architectural language and vocabulary previously established for List and McEwen Halls. The high point of the McEwen skylights was used to establish the overall height of the new hall, so that the massing of the new hall is not out of scale with that of the surrounding buildings. The McEwen basement level became the stage elevation, and the stage pit was set just above the water table. The schematic plans
and a model were completed. The design efforts were put on hold as fund-raising efforts began.



Wellin Hall: fan-shaped with shoebox sounds

After Robert Newman's untimely
death, the College's faculty and administration asked Ewing Cole if a shoebox-shaped hall could be accommodated on the site. A preliminary test fit suggested that it could with some increase in overall square footage. Shortly thereafter, the faculty, administration and Ewing Cole interviewed four acousticians and selected one to act as both acoustician and theater consultant. These consultants strongly favored a shoebox shape.

Accordingly, Ewing Cole worked with the acousticians/theater consultants to develop a traditional shoebox hall. It featured a sloped floor with fixed seating; above that, a balcony with seating ringing three sides of the room; above that, a technical tier ringing three sides of the room; and above that, a reverberation chamber. This design came in substantially over budget; efforts to scale it back as a shoebox failed.

At this impasse, Ewing Cole and the Hamilton faculty, administration, and board of trustees sought a second opinion on the acoustics of a fan-shaped hall from acousticians David Klepper and Gerald Marshall of Klepper Marshall King. According to KMK, in a relatively small hall of only 700 seats, acoustical failures more often occur because of mechanical system noise rather than because of a poorly shaped space. Nevertheless, KMK required that: 1) the fan be reduced from 60° to 45° to improve early lateral reflections; 2) sidewall reflectors be designed to improve early lateral reflections; and 3) acoustical draperies be designed to provide adjustable reverberation times (from 1.3 seconds to 2.3 seconds).

Ewing Cole worked with KMK and theater consultant Robert Davis to reconfigure the room in keeping with the new acoustical guidelines. In reducing the fan from 60° to 45°, "lost" seats were "recaptured" by lengthening the hall. The initial concept of a flat floor with movable seats was replaced by fixed seating on a gently sloped floor near the stage, and fixed seating on a steeply sloped floor at the rear of the room. This change limited the potential uses of the hall but improved the hall's use for traditional stage performances of music, dance and theater. Elaborate projecting sidewall reflectors were designed to reflect sound back to center seats. Angles were calculated to approximate angles found in shoebox halls.

Acousticians KMK could take sound
measurements within the completed hall and determine that the acoustical design requirements had been met, including reverberation times that could be adjusted between 1.3 and 2.3 seconds.

Pinchas Zukerman, with the St.
Paul Chamber Orchestra, opened the hall and proclaimed it "wonderful." The Laws of Physics had been obeyed. And the prayers to the Muses had been answered.