

Acoustics of a Baroque Opera House

N. Edwards^a, and D. Kahn^b

^a*Acoustic Dimensions, 24 Styvechale Avenue, Coventry, CV5 6DX, nedwards@acousticdimensions.co.uk*

^b*Acoustic Dimensions, 2 East Avenue, Larchmont, New York, 10538, dkahn@acousticdimensions.com*

The proscenium of the Baroque opera house provides an acoustic that favors a good balance between singers and orchestra. There are no opera houses today that have the acoustical properties of an original Baroque opera house because their forestages have been replaced either with audience seating or with an orchestra pit. This project provides an opportunity to restore an acoustical excellence that has not been heard for centuries.

Baroque opera houses combine acoustical characteristics that are found in small-scale recital halls with those that evolved into the nineteenth century grand opera house. In the recital hall, both singers and orchestra share the same acoustical space as the audience; the performers are surrounded on three sides by acoustically reflective walls, with the fourth side occupied by the audience.

In the Baroque opera house, the upstage wall of the recital room is replaced by the *occhio della scena* (the upstage opening of the proscenium at the stagehouse plaster line), but importantly the singer is still located between acoustically reflective 'side walls' – in this case the deep side walls of the proscenium. The singer is elevated well above the main floor audience ensuring an excellent line of direct sound to each member of the audience. The proscenium arch forms an acoustical overhead reflector that assists the singers' projection of sound both when they are located downstage and upstage.

The orchestra, on the other hand, is located in a less acoustically-favorable location, without being acoustically suppressed by the orchestra pit overhang of later opera houses. The orchestra placement at main floor level and behind a pit wall ensures the orchestra's sound is grazing over the heads of the main floor audience, which will naturally attenuate it. The orchestra do not gain acoustical advantage from the proscenium walls or the lower ceiling of the proscenium arch that aid the singer, as these are fully upstage of the orchestra and serve only to project the orchestra's sound to the upstage areas.

These are not newly-discovered aspects of Baroque opera house acoustics. In 1676, Motta reported on the acoustical importance of the deep proscenium in his 'Treatise on the structure of theatres and scenes' [1]

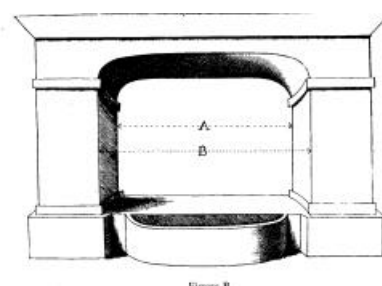


FIGURE 1. The proscenium of the Baroque Opera house

For speakers or singers located in the area between A and B in his illustration he notes: "[Those] who perform here to the accompaniment of the orchestra are heard just as beautifully as the orchestra.... This is a most important and necessary point" [1, p.26].

We have studied the acoustical importance of the Baroque opera house proscenium, forestage and orchestra pit locations using acoustical computer modeling techniques.

In our computer model of the Baroque opera house, we have 'illuminated' the room surfaces using a sound source located on the forestage on stage right, facing stage left.

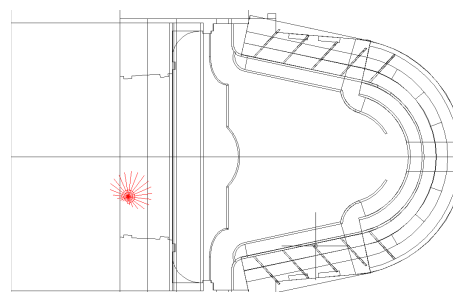


FIGURE 2. Singer location on the model forestage

In the model, we have adopted the voice directivity of 1kHz speech.

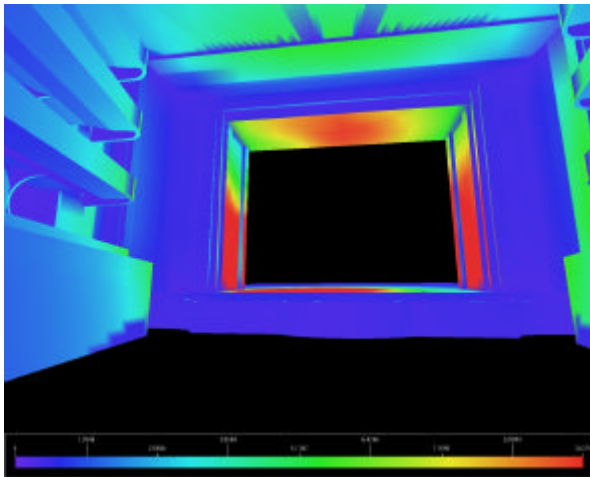


FIGURE 3. Scalar intensity of singer's voice is mapped as color on room surfaces.

In the computer model, the color indicates the strength of the direct sound impinging upon the surface. Note the red colors to the walls of the proscenium and to the soffit of the arch: these surfaces are strongly 'illuminated' by the singer's sound, and will scatter this sound into the main floor audience areas.

For comparison, we show below the same opera house but with the Baroque proscenium replaced by the thin proscenium wall of the later opera house:

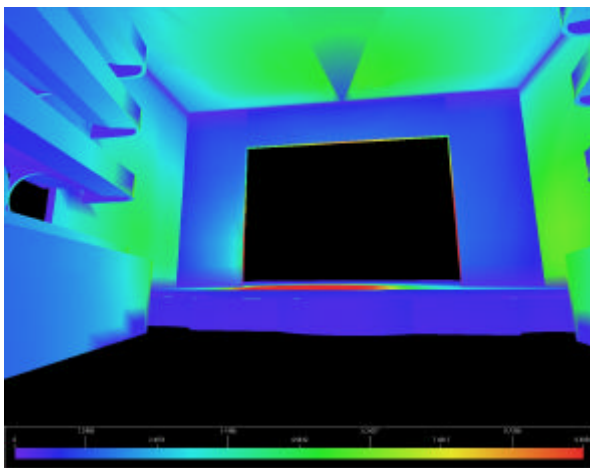


FIGURE 4. As Figure 3, but without Baroque proscenium

There is far less 'red' area in this view from the main floor. The largest red area remaining is in fact the stage floor, which will become a more visible from the upper levels of the opera house – and indeed the singer's voice would be more audible from the balcony levels of the house.

Similarly, views of the same computer model from the stage reinforce Motta's seventeenth century observations on the acoustical importance of the deep proscenium.

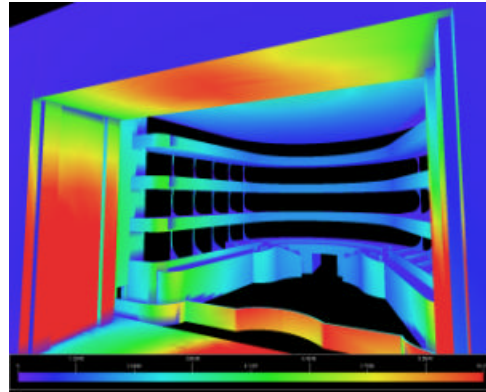


FIGURE 5. As Figure 3, but view from stage. Model with Baroque proscenium

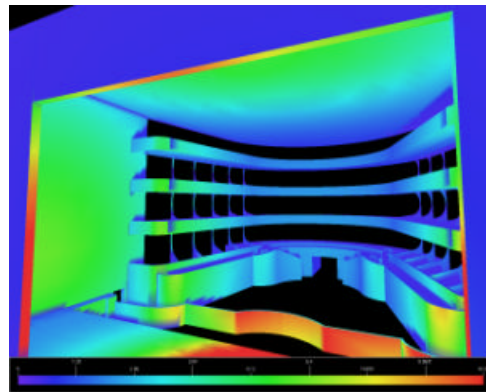


FIGURE 6. As Figure 4, but view from stage. Model without Baroque proscenium

In conclusion, the true Baroque opera house acoustic ensures that the natural acoustics provide an excellent balance between the singer and the orchestra – even when a performer is acting and facing across stage or partly upstage.

This Baroque opera house project provides an opportunity to restore an acoustical excellence that has not been heard for centuries.

REFERENCES

1. F.B.Motta., *The Theatrical Writings of Fabrizio Carini Motta*, Translation by O. Larson, Southern Illinois University Press, 1987.