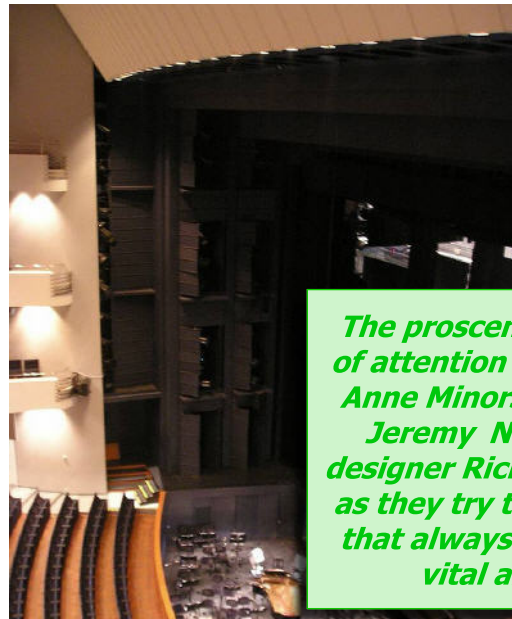


**A FIRST SOLUTION**

Moving on to the first of our solutions, we should consider the Helsinki Opera House (right) where there are some movable panels at the sides of the auditorium above the orchestra pit. Within this dark zone there are a number of lighting panels which can be opened to allow lights to shine through. This demonstrates one of the conflicts; the lights need to be positioned exactly where the sound-reflecting surfaces have to be to help the sound go out into the auditorium. This often happens all the way around an auditorium, not just in the proscenium zone. There is also an issue with this auditorium where, as I understand it, the theatre planners amongst you will probably feel that theatrically these dark side wall panels are creating a very large black cavern between the audience and the stage. So there are both an acoustic and a theatrical issue that need to be taken on board.



*The dark zone between auditorium and stage in the Finnish National Opera in Helsinki, showing the hinged panels and some lights*

*The proscenium zone is the focus of attention for theatre consultant Anne Minors, acoustic consultant Jeremy Newton and lighting designer Rick Fisher in this chapter as they try to resolve the conflicts that always arise in planning this vital area of a theatre.*

**A SECOND SOLUTION**

Earlier, Anne described solution number two in the Wales Millennium Centre in Cardiff (right). The two towers near the stage actually move in and out over a couple of metres as the width of the proscenium opening is changed, and they provide the sound reflections that we need. On the bottom part of each tower there is a fairly sound-scattering reflecting surface to help the reflections into the stalls seating areas. The curved ribbon shapes are surfaces which send the sound back into the stage and also back into the orchestra pit.



*The moving boxes near the stage in the Donald Gordon theatre in the Wales Millennium Centre*

All of the various acoustic considerations for the proscenium are dealt with in this design, but it also offers a good deal more flexibility because one of the things that acousticians like to do is to keep the width of the proscenium quite narrow. By keeping it narrow we are getting sound reflections from it, and they're arriving quite soon after the direct sound. When the auditorium is being used for other events requiring a forestage, even with large loudspeaker systems down there at stage level, then the towers can be pushed back to create a larger stage area. This is quite a neat solution. Also I believe, although others might perhaps feel otherwise, that it works quite well aesthetically and theatrically in linking the action through to the audience.

**A THIRD SOLUTION**

The third solution is that applied in the Copenhagen Opera House (right). Apart from the opera portal and architectural proscenium, the geometry of this room is all fixed, and so it has been designed to provide the sound reflections that are needed within this fixed geometry. Perhaps the sound going back to the stage for the singers to hear themselves



*The balconies in Copenhagen Opera continue almost up to the edge of the stage and the architectural proscenium*

*Photos: Arup Acoustics*