Experiences with grouping of the double basses in an orchestra pit

During most of my professional life I was employed by different theaters, so I have obtained considerable experience with orchestra pits and their intrinsic problems. For about three years I was substituting as a double-bass principal in the old theater of the Norwegian Opera (DNO), where the grouping of the basses changed from time to time, dependent on the different orchestrations. Here are some of my experiences in that respect:

Figure 1 shows the most commonly used grouping in DNO. Here, the entire bass section is placed as one row, tight against the back wall in order to save space. The principal, responsible for precision and the total group sound, is conventionally placed at the right extreme, as seen from the conductor (although sitting in the middle probably would have been more appropriate, at the small cost of easy identification by visiting conductors). With the entire group sitting so close to the rear wall, the principal does not hear much more of the group than the sound of his nearest colleague (the 2. bassist), while the rest is falling in this bassist's acoustical shadow. However, from the second bassist, the principal hears both the direct and reflected sound. One has to bear in mind that from the perspective of coordination, the frequency range 500 to 3000 Hz is likely to be the most important one, while the lower frequencies, which travel with considerably less obstruction, contain much less information about tone color/attack type/intonation, etc.

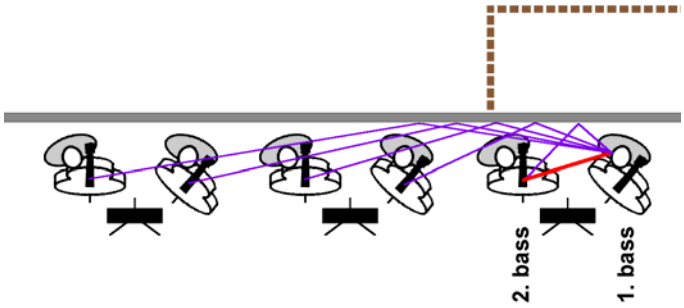

Figure 1: The entire bass section is seated close to the back wall (gray line). The second bassist is the only one that the first player can hear directly (red line). Even indirect sound (violet lines) from the other players falls more or less in the shadow of the second player. An even worse situation occurs when the group sometimes is shifted to the right, so that 1. and 2. basses are seated in front of a deep niche (dashed lines), where most of the back-wall reflections are absent. The second player's dominance becomes even more apparent. Generally, the group suffers from lack of contact.

A significant improvement can be obtained simply by moving the bass section forward (away from the back wall). Even though the principal still will be hearing the direct sound from second bass only (see Fig. 2), there will a very noticeable reflection from the back, benefitting everyone. If there is a prompter box with softly curved walls it may help projecting the basses on the left side to the principal, and vice versa. On the other hand, if the box is deep, it may obscure players (violins/violas) seated on the left side of the box, which is yet another argument for moving the bass section forward.

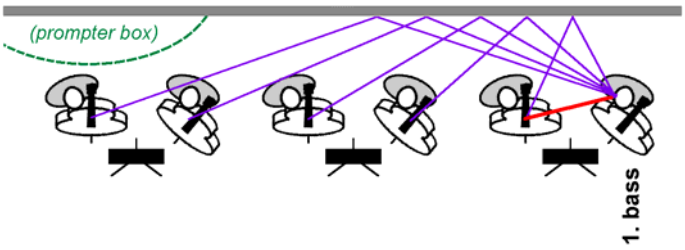

Figure 2: When the section is moved forward (away from the back wall) an improvement is experience by all the players. However, the principal is still hearing direct sound from the second player only. A prompter box with rounded walls will contribute to even better contact due to more reflections.

One possibility that provides good contact between the principal and the players at the wings is to line up the basses in an arch, as seen in Fig. 3. Here everyone hears direct sound, but the principal has least contact with the mid section. If the bass group is not too large, this formation does not require much more space than in Fig. 2, but one should remember that reflections from the rear will mostly be lost.

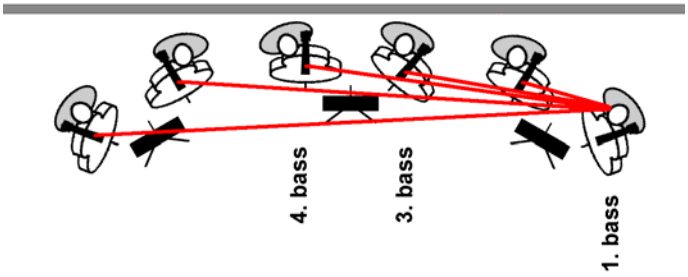

Figure 3: With the section lined up in an arch, the direct sound is significantly improved, while the effect of back-wall reflections is reduced, correspondingly. Everything considered, a fair solution.

The last, but absolutely best grouping seen from a section point of view, is the formation similar to what is used in most symphony orchestras (see Fig. 4). Here, the section is divided in two rows. Everyone is hearing some direct sound from the principal—and not least—everyone *sees* the principal, who on his/her side hears all well. One possible problem is that the section takes up to much space in the depth. And, chances are great that only one row will be used when the orchestration requires only half the group, in which case we are back to Fig. 1 again…

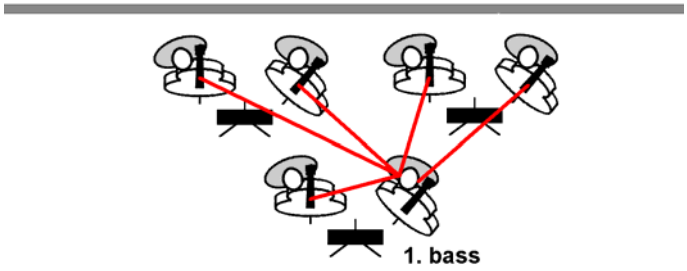

Figure 4: Arrangement that provides the best mutual contact, but requires considerable space in the depth, a dimension that is usually quite limited in orchestra pits.

If the formation shown in Fig. 1 is the solution to be chosen, it should—as it was done in the new opera of Oslo, Norway—be included an obstruction that prevents the bass section to be squeezed against the rear wall. In the new theatre of DNO, the last 70 – 80 cm against the wall is reserved for ventilation, etc. In most practical cases (dependent on the adjustable orchestra-pit depth) this system stand out like a low shelf, just enough to provide sufficient room behind the bassists to benefit from the back-wall reflections.

Contact via the floor

Anders Askenfelt[1] has shown how efficient vibrations can propagate through the floor and spikes between double basses, as well as through the air for certain frequencies. This is indeed an important factor when it comes to the players' coordination. It is thought-provoking to notice from Fig. 5 that with two basses, adjacent to each other on the floor—one actively played, and one passive —the bridge of the "passive" bass will vibrate almost as much as the one being played, in the frequency range below 60 Hz. The greatest implication of this is probably that it helps intonation, because interference between two basses played with slightly different pitches can be felt under the finger tips of both players. Finger pads have their greatest sensitivity around 250 Hz, so with fundamental frequencies well below that, and their corresponding overtones just in the right range, adjustments can be made by "feel" rather than ear in some cases.

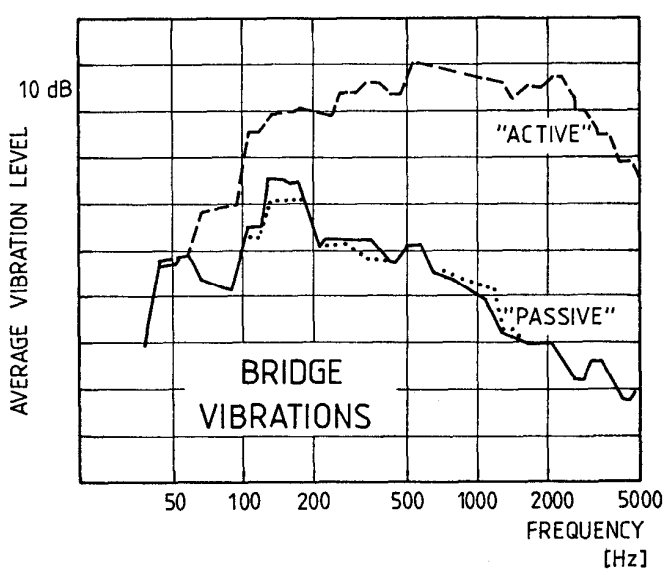

Figure 5: The vibrations in the support together with the near-field sound will set other basses into vibration. The figure illustrates the difference in the bridge vibrations when a bass is played on a riser ("active"), and when exposed to the excitation from another bass on the same riser ("passive"). The dotted line shows a case where the "passive bass was insulated from the riser vibrations by means of a piece of foam rubber (after Askenfelt, 1986).

The "liveliness" of the floor also has an impact on the "playability" of the double bass, as it is normally easier to play an instrument that is not supported by a rock-hard foundation[2].

[1] Askenfelt, A., "Stage floors and risers—supporting resonant bodies or sound traps?" Proc. conf.: Acoustics for Choir and Orchestra. Royal Swedish Academy of Music No. 52, 1986, pp 43-61.

[2] These phenomena are discussed in K. Guettler, A. Askenfelt, and A. Buen, "Double basses on the stage floor: Tuning fork–tabletop effect, or not?" J. Acoust. Soc. Am. Vol. 131 (1), Pt 2, pp 795-806 (2012).