

Hearing the curtains [DOI: 10.1051/EPN:2007005]

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If there is one place in the house that we like to sing in, it's the bath. The reason is the unusually long reverberation time: the exponential decay of any sound is slow. It is all described by Sabine's law, which states that the typical decay time of sound in a room is proportional to the volume of the room and inversely proportional to the total area of surfaces that completely absorb the sound (like an open window would, for example).

So if it comes to reverberation, the bath is pretty unique. It usually has bare walls, tiles on the floor, and little or no furniture that could absorb sound. Even our own clothing may give a much smaller contribution than usual - if it gives any contribution at all.

That leaves only the curtains as an efficient means for absorbing the sound, if we assume that we do have curtains in our bath. So if we *really want* to enjoy our own singing, we would probably be well advised *not* to close the curtains but leave them open, in order to have as small an absorbing surface as possible and hence a

maximum reverberation time. That seems very plausible, if we follow our physical intuition.

Wrong. Whether we have the curtains open or closed makes very little difference for the sound absorption, and hence for the reverberation. The reason is somewhat subtle: the sound is dissipated at surfaces indeed, by friction losses of the sound waves near the surface. But, more precisely, we have to consider the microscopic surface of the material, which includes the pores. That is the reason why porous media like thick draperies, carpets, fibrous mineral wool, glass fiber and open-cell foam are usually good sound absorbers. And for the curtains this means: as long as the sound waves have easy access to the inner surface, it does not matter much whether the curtain is spread out over the entire wall or bundled together in a corner of the room.

The conclusion therefore must be: With our eyes closed, we can't really tell whether the curtains are open or closed. We do notice, however, if they happen to be at the dry cleaner's. ■

