

# The sound of old music

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In addition to their shape, the material that brass instruments are made of determines their sound. This was demonstrated by acousticians in a project funded by the Austrian Science Fund FWF on reconstructing the sound of historical trombones.

The trombone probably saw the light of day in the 15th century. Over the centuries, this brass instrument has undergone significant changes both in its shape and its [sound](#). The early or Renaissance trombone was marked by a lightweight design, a clear sound and flexibility of tone. The sonic characteristics of the trombone make it blend well with the human voice.

What might it have sounded like when the "Ensemble Canzone" were performed, written for the trombone by the famous Venetian composers Andrea and Giovanni Gabrieli? This is a question that musicians and instrument makers have puzzled over to this day. While historical-music practice has traditionally focused on rebuilding instruments as near to the originals as possible in terms of size and shape (bore profile), researchers now also examine other, more complex factors – such as the material – in order to achieve the greatest possible likeness with the original.

## The material makes a big difference

In a project supported by the Austrian Science Fund FWF, scientists at the Institute of Music Acoustics, Wiener Klang (IWK) have conducted intense research to find out how much the sound of the trombone is

influenced by the properties of its material and the techniques used for processing it. Under the guidance of principal investigator Wilfried Kausel, the instrument maker and musician Hannes Vereecke first went to see and document old trombones in various collections and museums and then subjected them to tests involving material-science methods. In the acoustics laboratory of the IWK at the Vienna University of Music and Performing Arts, Kausel and his team were finally able to prove that the vibrations of the brass have an (audible) impact on the sound. "For a long time, conventional wisdom maintained that the only significant aspect was the shape of the instrument, and not the material properties," explains Wilfried Kausel, an electrical engineer and musician by training. "Now we have evidence for what musicians and instrument makers have always claimed: it makes an audible difference, and one that the player can sense, whether the metal is thin or thick, whether it has been hand-hammered, like historical instruments, or processed by modern methods such as rolling, drawing or, as is the case of the trombone, pressing," says Kausel.

## **Measuring acoustic properties**

In order to get closer to the sound of old music, the Viennese researchers first determined the properties of samples of modern and historical metals and then demonstrated the influence of instrument wall vibrations on the sound at the laboratory. A horn blown by "artificial lips" was muted by applying sand around the outside and the sound of it being played was then recorded and analysed. "We progressively damped the vibrations of the brass during the playing," says Kausel in explaining the method used. The researchers were able to observe how the sound spectrum changed in the process. The vibrations of the instrument's wall clearly had an impact on the ensuing sound. In a next step, the acousticians tried to find out which types of vibration caused these sonic differences. They discovered that a longitudinal vibration has the greatest influence on the sound of a trombone as the bell oscillates along

its length. The larger the instrument, the more pronounced the vibration. The computed vibrations tallied with the preceding measurements. The most important mechanism to determine the sound was thus identified and can now be taken into consideration when recreating historical instruments.

## **Directions for recreating instruments**

In an interactive process involving music research, instrument makers and material sciences, the IWK's FWF project has not only documented the history of old brass instruments but also established directions for historical manufacturing techniques, information on vibration and resonance properties and the reconstruction of the sound of the Renaissance trombone. Hannes Vereecke himself recreated the instruments using to the greatest possible extent original material and manufacturing processes and equipped an ensemble with these instruments. The Belgian expert now shares his knowledge in the master classes of the Oscar-Walcker-Schule in Ludwigsburg, where woodwind and brass instrument makers from all over the world receive training.

**More information:** Hannes Vereecke: "The Sixteenth-Century Trombone: Dimensions, Materials, and Techniques," Brepols Publishers, May 2016. [www.brepols.net/Pages/ShowProd...d=IS-9782503566399-1](http://www.brepols.net/Pages/ShowProd...d=IS-9782503566399-1)

Hannes Vereecke: "Brasswind engineering: Some practical observations (Abstract)," in Proceedings of the Third Vienna Talk on Music Acoustics, edited by Alexander Mayer and Vasileios Chatziioannou and Werner Goebel (Institute Of Music Acoustics, Wiener Klangstil), Vienna, Austria p. 117-117, 2015. [viennatalk2015.mdw.ac.at/?page\\_id=13002&pap=110](http://viennatalk2015.mdw.ac.at/?page_id=13002&pap=110)

Fruehmann, B.; Vereecke, H.; Schreiner, M., and Kausel, Wilfried:

"XRF Analysis of nine Renaissance Nuremberg Trombones," in Proceedings of the 14th EXRS 2012 - European Conference on X-ray Spectrometry, Vienna, Austria p. paper 51., 2012. [https://www.google.at/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwijm8a49aHMAhXDkSwKHQJqDj8QFggjMAA&url=http%3A%2F%2Fiwk.mdw.ac.at%2Fflit\\_db\\_iwk%2Fdownload.php%3Fid=16273&usg=AFQjCNHtlgm2aMNDj8AU24E7mjTx3yEIIQ&cad=rja](https://www.google.at/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwijm8a49aHMAhXDkSwKHQJqDj8QFggjMAA&url=http%3A%2F%2Fiwk.mdw.ac.at%2Fflit_db_iwk%2Fdownload.php%3Fid=16273&usg=AFQjCNHtlgm2aMNDj8AU24E7mjTx3yEIIQ&cad=rja)

Vereecke, Hannes W.; Frühmann, Bernadette, and Schreiner, Manfred: "The Chemical Composition of Brass in Nuremberg Trombones of the Sixteenth Century," Historic Brass Society Journal (HBSJ) 24, 61-75, 2012. [https://www.google.at/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwi937bZ9KHMAhVIjywKHfjwBroQFggjMAA&url=http%3A%2F%2Fiwk.mdw.ac.at%2Fflit\\_db\\_iwk%2Fdownload.php%3Fid=16623&usg=AFQjCNG7ED98cVtwDN3-DBmGcxBgh6\\_JOA&cad=rja](https://www.google.at/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwi937bZ9KHMAhVIjywKHfjwBroQFggjMAA&url=http%3A%2F%2Fiwk.mdw.ac.at%2Fflit_db_iwk%2Fdownload.php%3Fid=16623&usg=AFQjCNG7ED98cVtwDN3-DBmGcxBgh6_JOA&cad=rja)

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