

BRIDGING THE GAPS IN THE HARMONIC SERIES: VALVES, SLIDES AND FINGER HOLES IN BRASS INSTRUMENTS.

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ABSTRACT

On almost all lip-excited wind instruments it is possible for the player to sound a series of different pitches corresponding to the different acoustic resonances of the air column inside the instrument. The pitch intervals in this series depend on the bore profile of the instrument, which is usually designed so that the acoustic resonance frequencies of the basic tube are close to being members of a complete harmonic series. To obtain a chromatic scale over the compass of the instrument it is necessary to sound pitches which bridge the gaps between the harmonics, and several stratagems have been developed which allow this. The oldest method is to puncture the tube with side holes which can be opened or closed by the fingers. A fifteenth century innovation was a sliding section which allowed the tube length to be varied continuously. By the second decade of the nineteenth century valves had been designed which permitted discrete additional sections of tubing to be added to the basic bore. Some musical consequences of the science underlying these three approaches are explored in this review.