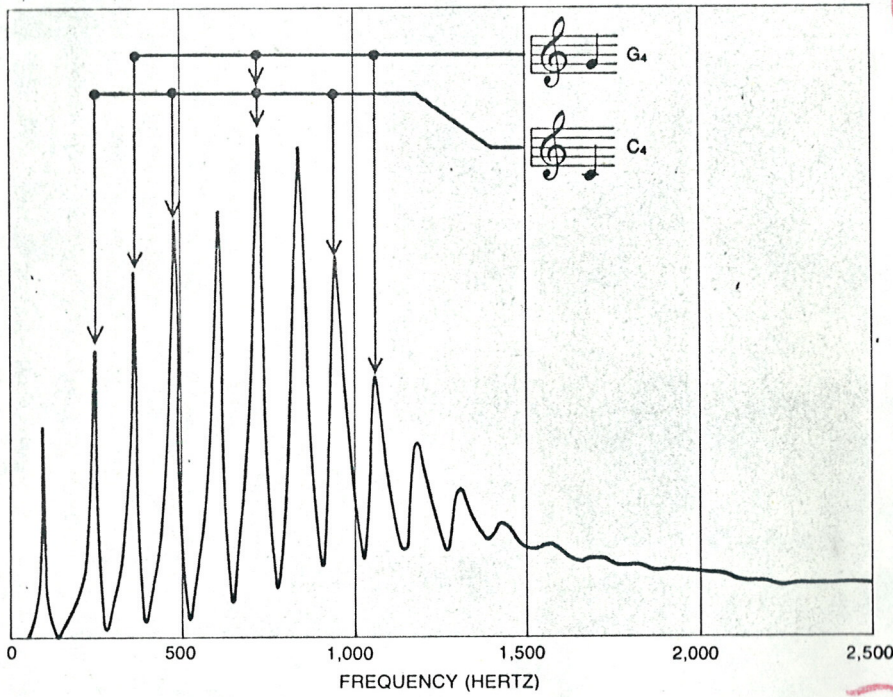


INPUT IMPEDANCE

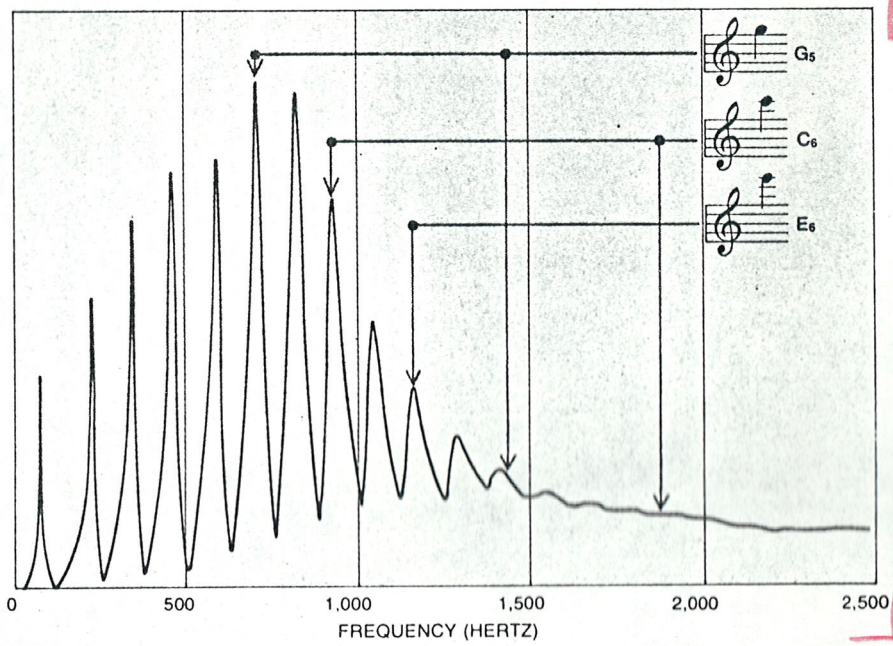
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IMPEDANCE PATTERN OF A MODERN TRUMPET is annotated to show what happens when a player sounds the notes C₄ or G₄. When he blows into the horn, a "regime of oscillation" is set up in which several impedance maxima of the air column collaborate with oscillations of his lips to generate energy in a steady oscillation that contains several harmonically related frequency components. The regime of oscillation for the C₄ note involves the second, fourth, sixth and eighth peaks in the curve. When the trumpeter plays very softly, the second peak is dominant, but because this peak is not tall the beginner may produce a wobbly note. As he plays louder the other peaks become more influential and the oscillation becomes stabilized. The dominant oscillation for the G₄ note corresponds to the third impedance peak; since it is taller than the second peak, G₄ is easier than C₄ to play pianissimo. As the trumpeter plays louder the tall sixth peak comes in and greatly stabilizes the regime of oscillation, making the G₄ one of the easiest notes of all to play.

INPUT IMPEDANCE

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REGIMES OF OSCILLATION FOR HIGHER NOTES show why they become increasingly hard to play as one moves up the scale. G₅ is still quite easy to play because its regime of oscillation is dominated by the tall sixth impedance peak; the 12th peak makes only a minor contribution. C₆ is somewhat more difficult to play because the dominant peak of the note is lower than the peak for G₅. It takes an athletic trumpeter to reach the high E₆ and higher notes. The trumpet at this point has become virtually a megaphone: the energy production of the instrument is due almost completely to the interaction of the air column with the lips themselves, much as the human larynx operates in producing vocal sounds.