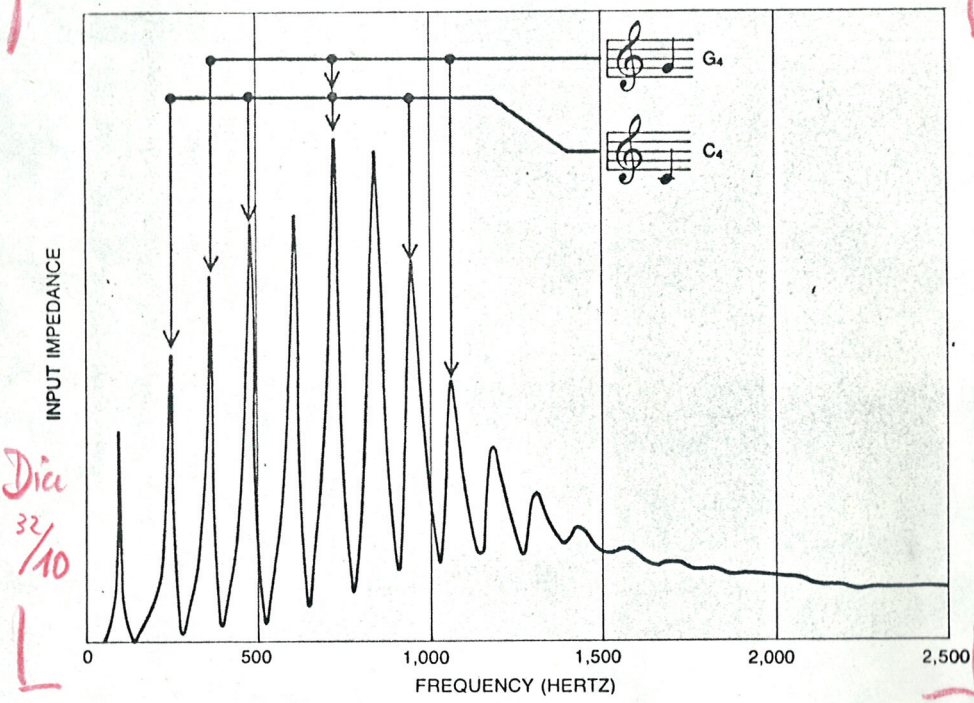
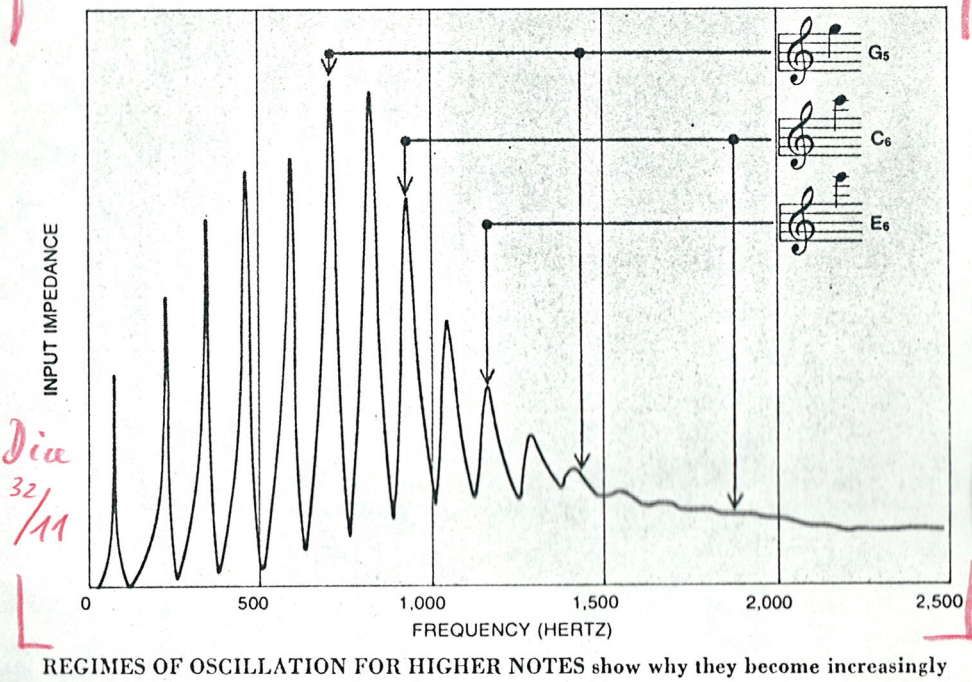


IMPEDANCE PATTERN OF A MODERN TRUMPET is annotated to show what happens when a player sounds the notes C_4 or G_4. When he blows into the horn, a "regime of oscillation" is set up in which several impedance maxima of the air column collaborate with oscillations of his lips to generate energy in a steady oscillation that contains several harmonically related frequency components. The regime of oscillation for the C_4 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 G_4 note corresponds to the third impedance peak; since it is taller than the second peak, G_4 is easier than C_4 to play pianissimo. As the trumpeter plays louder the tall sixth peak comes in and greatly stabilizes the regime of oscillation, making the G_4 one of the easiest notes of all to play.



REGIMES OF OSCILLATION FOR HIGHER NOTES show why they become increasingly hard to play as one moves up the scale. G_5 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. C_6 is somewhat more difficult to play because the dominant peak of the note is lower than the peak for G_5. It takes an athletic trumpeter to reach the high E_6 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.