

TRUMPETS AND OTHER HIGH BRASS

A HISTORY INSPIRED BY
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Ways to Expand the Harmonic Series

SABINE KATHARINA KLAUS

Principal Photographer

MARK OLENCKI

Fingerhole Positions

The position and size of the tone holes influence the pitch of each note. The following rule and its corollary apply: The smaller the tone hole and the nearer it is to the bell, the less the pitch rises when opened. The larger the tone hole and the closer it is to the mouthpiece, the more the pitch rises. The position of the tone holes is determined not only by musical, but also by ergonomic considerations; the distances between the holes are limited by the reach of the fingers. To compensate for these limitations, tone holes can be undercut according to the following rules: undercutting the hole in the direction of the mouthpiece raises the pitch; undercutting the hole in the direction of the distal end lowers the pitch. Undercutting was sometimes done later to change the intonation or the temperament of a cornetto. However, it is often difficult to decide whether it was done by the maker or by a later user, unless the undercutting is of noticeably different craftsmanship to the rest of the instrument.

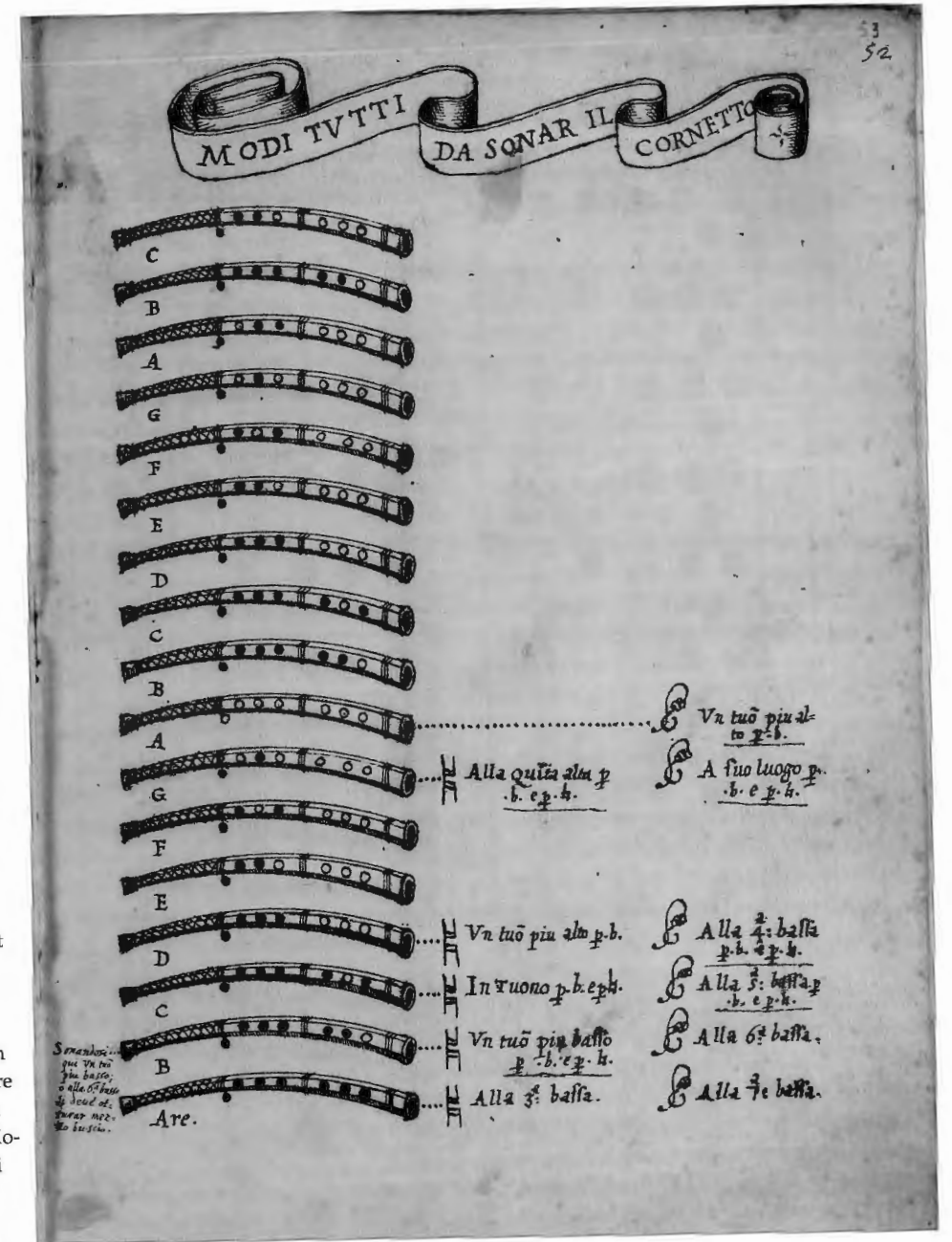
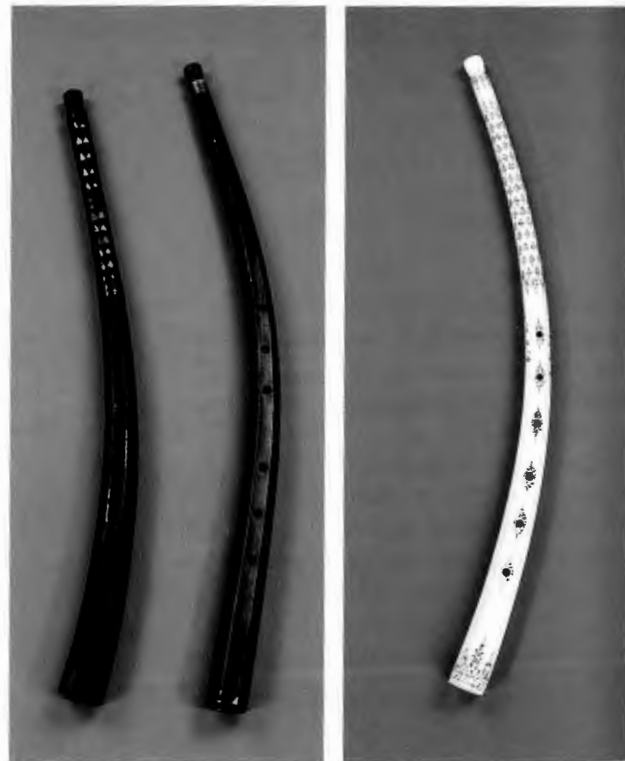
Marin Mersenne provides the following measurements for his *dessus des cornets*:¹¹⁹ The overall length of the *dessus des cornets* is $1\frac{3}{4}$ *pieds* (569.8 mm). The distance from the lower end to the center of the sixth fingerhole is three *pouces* (81.4 mm). The distance from the mouthpiece receiver end to the center of the first

hole is ten *pouces* (271.33 mm). The layout of the tone holes is thus determined by the position of the outermost fingerholes. Mersenne additionally gives the distance between the individual fingerholes as 13 lines (29.39 mm). According to Mersenne, the distance between the two groups of fingerholes (that is between the third and the fourth fingerholes) is only 7 lines (15.83 mm), and therefore smaller than the distance between the other holes. This is surprising, since it corresponds neither to his drawings (where the tone holes seem to be equidistant) nor to surviving instruments. For the *basse des cornets*, on the other hand, Mersenne gives the distance between the individual fingerholes as one inch, while the distance between the two groups of fingerholes is half a foot or six inches.

Herbert Heyde has observed a proportional layout of the fingerhole positions on some surviving cornetti, and an empirical layout on others.¹²⁰ John McCann, who has measured many historic cornetti, states that while there are some generalities in terms of fingerhole locations, there does not appear to be a constant.¹²¹ Friend Overton, on the other hand, developed formulas by which fingerhole positions on cornetti could be calculated.¹²²

	NMM 10135	NMM 10136	NMM 7368
length	542	580	577
diameter at receiver	9.4/7.5	9.3/7.5	10.9/8.3
diameter at end	28.5	25.4	24.5
first hole	229	237	260
second hole	269	277	299
third hole	308	315	340
fourth hole	355	383	388
fifth hole	397	422	431
sixth hole	440	461	474
thumbhole	208	none	227
average hole size	8.5	7.7	6.5

2.97–98 Measurements of tone-hole positions found on the cornetti NMM 10135 (left), NMM 10136 (center), and NMM 7368 (right) in millimeters. The length is measured along the center of the curvature. The diameters give the internal measurements of the bore. The fingerhole positions are measured from the mouthpiece receiver end to the beginning of the tone hole.



2.99 This fingering chart (*Modi tutti da sonar il Cornetto*) from Aurelio Virgiliano's, manuscript *Il Dolcimelo*, ca. 1600, specifies cross-fingering for the note *c*¹, possibly reflecting an idiosyncrasy of Italian cornetti in which the two groups of fingerholes are closer together than on German instruments (© Museo internazionale e biblioteca della musica di Bologna, Ms. C 33, 53^r).

Edward Tarr has observed that the two groups of fingerholes on the front are often spaced further apart on cornetti of supposed German provenance than they are in Italian instruments.¹²³ Tarr found that cornetti with a smaller space between the two groups of fingerholes (Italian design) require cross-fingering to intone *c*¹ correctly, while those instruments with a larger gap (German design) allow the *c*¹ to be played with the two lowest tone holes open.¹²⁴ These two variants are possibly reflected in the slightly different fingering systems

found in Italian and in German treatises of the time. Aurelio Virgiliano's manuscript *Il Dolcimelo*, *Libro Terzo* from ca. 1600 shows the cross-fingering for *c*¹ in his depiction of the *Modi tutti da sonar il Cornetto*, (complete fingerings for playing the cornetto).¹²⁵ On the other hand, the three above-mentioned German tutors by Speer, Majer, and Eisel from the late seventeenth and early eighteenth centuries all show *c*¹ with the two lowest fingerholes open—a feature of the so-called "German-fingering" system.¹²⁶



3.15 This serpent, made entirely of leather without a wooden core, dates from the late sixteenth or early seventeenth century and is most likely of Italian origin (© Bologna, Museo internazionale e biblioteca della musica, no. 1829).



3.16 This serpent from the Ambras collection retains the zoomorphic feature of a snake's head. It is documented in 1665, but could also be the bass of the group of snake-shaped instruments listed in the Ambras inventory from 1596 (© Kunsthistorisches Museum, Vienna, SAM 237).



3.17–18 This serpent by Pellegrino de Azzi, Venice, before 1797 (Boston Symphony Orchestra, Casadesus Collection, no. 64) is a late exemplar of a serpent with a dragon's head.



Herbert Heyde has argued that the serpent most likely originated in Italy, not in France.¹⁶ The serpent's derivation from Italian snake-shaped cornetti, as outlined above, supports this hypothesis, which is also lent credence by two early surviving serpents, possibly of Italian origin, that date from the late sixteenth or early seventeenth century, and a third signed by an Italian maker active in the late eighteenth century. The presumably earliest of the three is housed in the Museo internazionale e biblioteca della musica in Bologna (no. 1829). Noteworthy are the V-shaped bends and oblique straight sections; the bell terminates in a simplified dragon's head. It measures about 1490 mm in length with an internal bore diameter of ca. 12 to 65 mm. There are two groups of fingerholes, four on the upper bend

and three on the lower, as well as a tone hole on the back. John Henry van der Meer has questioned the suitability of this instrument for making music, based on the positions of the tone holes, and suggested that it may have been intended as a stage prop.¹⁷ However, in palm down position of the right hand and palm up position of the left, all fingerholes and the thumbhole can be reached. This serpent is exceptional in being made entirely of leather without a wooden core.

The second serpent with zoomorphic features is preserved in the *Sammlung alter Musikinstrumente* in Vienna (SAM 237).¹⁸ Originally from the Ambras collection, this instrument is first mentioned as *Serpentin* in an inventory from 1665.¹⁹ It is certainly also possible that this is the bass of the snake-shaped instruments

mentioned in the 1596 Ambras inventory. There are six fingerholes on the front, but no thumbhole. The snake's head with remnants of red paint inside is at the mouth-piece end, thus providing a more realistic representation of the animal. The initial bore, with a diameter of 26.5 mm, is formed by a metal sleeve inside the snake's head; the overall effective length of the instrument is 1807 mm with a terminal diameter of ca. 91 mm, resulting in 8-foot C. A recent examination with X-ray tomography revealed that this serpent is pieced together from a total of thirty U-shaped wooden segments of irregular form and thickness. Moreover, stamped into the leather at the bell end are the initials *GFP* and a master's mark in the form of a shoe, presumably that of the person who made the leather covering. Schlosser assumed

Italian provenance and suggested that it was made at the end of the sixteenth or in the early seventeenth century,²⁰ while Darmstädter considers a possible provenance from German-speaking regions.²¹

A third serpent with a dragon- or snake-head bell, and also featuring applied mythological figures playing various musical instruments, is preserved in the collection of the Boston Symphony Orchestra.²² It is signed *PELLEGRINO DE AZZI / VENEZIA* and bears the arms of the Republic of Venice, allowing it to be dated to before 1797.²³ A late example of the dragon-head style, it is the only serpent among this group that actually bears the name of an Italian maker.