

The Serpent Known as "French": Aspects of the Instrument and its Sound

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The serpent is a lip-energized bass aerophone and, therefore, considered a member of the "brass" family of instruments, the best known of those made from wood and covered in leather. It is played by means of a cup mouthpiece similar (about the same dimensions) to that used by the trombone. The serpent, with its very wide bore conferring a sonority, deep and sweet, owing partly to its resonance and its use, was seemingly always ecclesiastical in its initial period. Its employment as the principal instrument for supporting voices in the church appears to be a French peculiarity,¹ while its presence in the other European countries did not become apparent until the eighteenth century, often in a military role, in wind bands or in the orchestra.

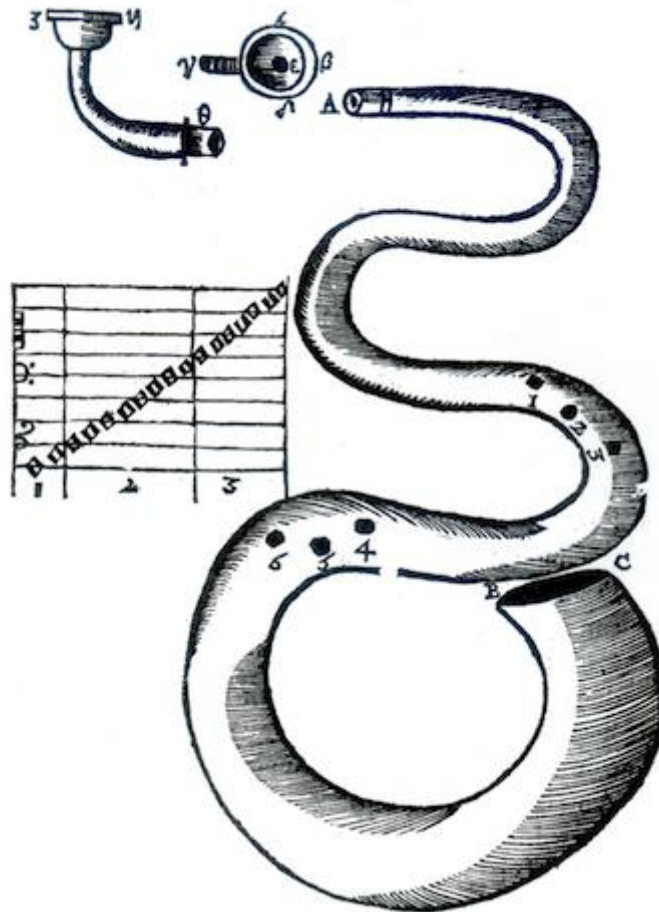


Fig. 1. Serpent, engraving, c. 1636, extract from *Harmonie Universelle* by Marin Mersenne, op. cit., "Proposition XXIV," p. 279.

In France, the standard instrument appears in the form of a double "S" in which the branches are parallel and the bends are U-shaped. Six finger-holes are positioned in two groups of three, allowing the player to produce all of the chromatic notes in the

registers of the tenor and bass voices. A metal bocal (or crook) is fitted into the upper end of the serpent, and a mouthpiece is placed into the smallest end of the bocal. This type of instrument was described for the first time by Marin Mersenne in his 1636 publication, *Harmonie Universelle* (fig. 1),² and was often called the "French serpent" in contrast to English or Italian serpents.³ Serpents of this type, "French," are found in numerous European collections; yet, since most do not have maker's marks and are without known provenance, their connection to France is difficult to determine.

From the point of view of its structure, the serpent comprises two carved half-cylinders each divided into several sections. The two half-cylinders are glued longitudinally, and a brass collar reinforces the end joint for a bocal, which allows the mouthpiece to be positioned comfortably for the player. Mersenne's *Harmonie Universelle* is the only French treatise to describe the serpent's method of construction: "But it should be remarked that the Makers have three or four dozen pieces of stiff paper cut in semicircles which are made crescent-shaped, in order to broaden the space, or the duct, of the Serpent little by little; which they make of two pieces, like Cornetts, that are then pasted together after they are hollowed out."⁴

Serpents were used daily for each church service, and their wear could be significant. In general, their curved structure bears down on the space perpendicular to the grain of the wood, making it very fragile, notably on the first elbow because of the bocal, which maintains a pressure on the wood while the musician plays. Moreover, Mersenne indicates in this respect that "because it is the custom to lift and to carry it by the first strand (...) the leather below is tightened along the sinews of the animal, which tears through stimulation."⁵



Fig. 2. Coeffet, serpent, Musée de la Musique, Paris, E.2204.

Manfredo Settala, a Milanese collector, had planned to include an engraving of a serpent in his instrument collection's catalogue published in 1664.⁶ The illustration, under the name of "Carolus Gallutius" (and similar to that reproduced by Mersenne), is preserved in the Biblioteca Estense (Modena, Italy) but was never printed in the various editions of the publication. The author of the catalogue, Paolo Maria Terzago, described the illustration as "a musical serpent that has been used by the French for many years."⁷ This reference leads to the conclusion that the instrument was not well-known at that time in Italy.⁸ With our present state of knowledge, it is difficult to determine the use of the serpent in other European countries before the seventeenth century.

The Collection of the Musée de la Musique de Paris

Museum instruments constitute an important source of knowledge about the structure of the serpent. For those instruments in the form of the double "S" found in

collections all over Europe, determining the date of construction poses a major problem. Effectively, the initial form of the serpent, such as that described by Mersenne, lasted until the nineteenth century. The upright serpent (which appeared at the end of the eighteenth century) and the presence of maker's marks allow for the construction date to be determined; however, serpents in traditional double "S" form, being generally anonymous, are impossible to date. Before the end of the eighteenth century, the name of a serpent maker is never mentioned. Garsault, in 1761 in his *Notionnaire raisonné*, declared "the serpent is made by carpenters,"⁹ a comment suggesting the absence of specialized serpent makers at that time.

The Paris Musée de la Musique collection includes seventeen serpents in the form of the double "S" representing the "French" style. The first category of serpents is characterized by its simple structure, similar to the instrument appearing in Mersenne's treatise. The bore is slender, the wood is quite thick, and the bell approaches the opposite elbow. This style is represented by instruments E.2202 (Fig. 2) and E.2205 (Fig. 3) - where keys have most likely been added later - and serpent E.2387,¹⁰ which is shorter than the first two. These three instruments come from the Paul Cesbron Collection. Because of their form, the serpents were dated from before the nineteenth century; however, the discovery by Thierry Maniguet of a maker's mark on instrument E.2204 - by Coëffet who was active c. 1830 at Chaumont-en-Vexin - contradicts this hypothesis. The two other instruments do not have any builders' insignias; however, serpents very similar to these appear in other collections (e.g., the Michel Godard Collection; instrument 2005.372 in the Metropolitan Museum in New York City; inventory 1886.116 in the Musikmuseum Historisches Museum in Basle).



Fig. 3. Anonymous, serpent, Musée de la Musique, Paris, E.2205.

A second category comprises instruments by the maker Baudouin (Fig. 4), father and son, the principal Parisian makers of serpents at the beginning of the nineteenth century who worked in rue d'Enfer Saint Michel from 1824 to 1839. These instruments all corresponded to the traditional form with a larger bore than those of the serpents previously described and with occasionally the addition of one to three keys.¹¹ Finally, a third category corresponds to anonymous instruments similar to the serpent by Dufeu (Fig. 5).¹² I have not yet mentioned the possibility of the existence of a family of serpents including all the voices (soprano, alto, tenor, bass). The bass instrument appears to be the "standard" model [1988 mm as noted by Mersenne]. Nevertheless, there are two smaller serpents, one in the Musée de la Musique de Paris (E.2387), with the body measuring 1510 mm and sounding a fourth higher, and another housed at the Unterlinden de Colmar Museum, instrument No. MU10 (Fig.

6) where the body measures 1080 mm and sounds an octave higher. These two instruments are unique specimens and, perhaps, may have been used for the education of choirboys.



Fig. 4. Baudouin, serpent, Musée de la Musique, Paris, E.01292.

The Pitch of the Serpent

Because of the important ecclesiastical use of the serpent [serpent d'église, i.e., church serpent], its pitch is in accord with the *ton de chapelle* [chapel tone]

described by Mersenne as "low pitch" approximating $a=392$; however, this is difficult to determine precisely.¹³ Hector Berlioz's *Treatise on Modern Instrumentation* provides valuable information on the subject: "there are three notes which are much stronger than the others: d , a , d ." Thus, Berlioz considers the serpent to be a transposing instrument in Bb.¹⁴ A very simple calculation leads to the conclusion that if the instrument is considered as a transposing instrument in B-flat, then this corresponds to French church pitch, *ton de chapelle*. The musician familiar with the church system in d must therefore transpose a tone lower to adapt to orchestral pitch, the transposition used by instruments in B-flat. Berlioz's serpent, then, may be an instrument in d according to church pitch (since the pitch of the orchestra of Berlioz's time was close to a 440 and church pitch appeared very close to a 392).

By playing pitches on serpents in the collections of the Paris Musée de la Musique (E.2204 and E.01292 whose lengths are average for the collection), this low pitch can be corroborated. The pitch of a serpent still remains uncertain for two reasons: firstly, since the bocal can slide into the instrument, this allows for the pitch to be changed often by more than a quarter of a tone. Louis-Joseph Francœur, who lamented the variation in pitch resulting from the bocal, noted:



Fig. 5. Dufeu, serpent, Musée de la Musique, Paris, E.01295.

Almost all those who play this instrument have a bad habit of using a bocal that is too long and raises or lowers the pitch as it is inserted more or less into the instrument's first branch, causing a strangulation at the bottom of the inside of this branch.¹⁵

Secondly, the serpent is an instrument that permits great variation in pitch. Instrumentalists can adjust the intonation of notes by simply slackening their lips, without changing the fingering, and this can alter a pitch by more than a fifth on certain low notes.

It is this adjustment that Émile Leipp explains in connection with the production of sound by the lips:

Remember that the vibrating system of the lips-mouthpiece is a "strong" system in regard to the strong air pressure and to the relatively important output utilized in lip-

vibrated instruments of the horn type, and this emphasizes the importance of considering the problem of coupling the sounding-body with the mouthpiece. The way that this coupling works allows us to understand the acoustical anomalies apparent in the serpent. The air-column, because of the form and the state of the internal surface of the serpent's bore, is a "weak" system which may be comfortably forced into vibration by a "strong" system. Now everything becomes clear: the lips produce the frequency required by the musician, and this continues in sequence: the lips "force" the air-column to vibrate at the chosen frequency to a large extent, so much so that it stimulates the lowest frequencies (the longer the air-column, the more muffled).¹⁶



Fig. 6. Anonymous, serpent, Colmar Unterlinden Museum, MU.10.

The mouthpiece, that indispensable accessory, has a very important effect on the characteristics of the sound of the serpent. For this study I have taken into consideration 27 mouthpieces from the collection of historical mouthpieces preserved in the Paris Musée de la Musique, all suitable and thought to have been used with a serpent, as determined by the following criteria: the outline and the form of their shank, appropriate size for the bore of a serpent, and the cup generally seen in those associated with a serpent or in the descriptions presented in the treatises and methods for serpent. (Fig. 7).¹⁷ This selection, however, does not allow for the determination of a standardized model of mouthpiece.

While the collection of serpents of the Musée de la Musique is very homogeneous, the assortment of mouthpieces comprises many types of shapes, material, and cup

profiles. In the absence of maker's marks, it is impossible to date these specimens. Despite the diversity of this collection, commonalities can be identified:

- the material is for the most part ivory, bone, or horn and sometimes wood or metal (doubtless for military serpents);
- the diameter varies greatly and is within 22.5 to 31 mm;
- the cup is most often of quasi-spherical form, flattening-out towards the throat. Others have a more conical cup, but with a flattening at the throat;
- the rim is thin;
- the throat has a sharp angle at the bottom of the cup;
- the internal profile of the shank forms a cone, usually regular;
- the end of the shank is narrow and attenuated.

Two different types of mouthpiece emerge from this review: mouthpieces with a conical cup and those with a spherical cup. This first is most common. The following table shows two mouthpieces, illustrating the two principal types of cup shape. X-ray examinations have allowed their profiles to be shown precisely (Fig. 8). Physical measurements are very difficult to obtain and to interpret owing to the relationships among the shape of mouthpiece, the timbre of the instrument, and eventual interference in the sound. A decision was made to experiment by constructing copies of these mouthpieces after careful study of X-rays prepared by Serge Delmas.

A very conical mouthpiece gives a more or less strong and brilliant sound but also produces many impurities. This type of mouthpiece was most likely intended for military serpents which needed to sound loud when played out-of-doors. In contrast, the spherical type of mouthpiece gives a sweeter sound, round and resonant like that of the voice, perhaps adapted to the accompaniment of the choir in church music, the instrument's main function in the period under review. The use of a mouthpiece with sides at sharp angles is often found to produce a tone very strong in impurities. Even if these are less audible in a reverberant acoustic, at many metres distance from the listeners, they are still present.

A mouthpiece must always be adapted to the specific instrument as well as to the instrumentalist who uses it, which is precisely what is often stated in the methods. Métoyen notes: "Too large a mouthpiece favours the low notes of the instrument and does not easily ascend. Too small a mouthpiece, on the contrary, ascends easily but the low notes are thin and difficult to play. It is therefore necessary for a compromise, chosen by the teacher because of the fatness or thinness of the student's lips; thus, the teacher must decide which will be the most advantageous."¹⁸ These principles serve to determine what each individual player must adopt. Moreover, in the absence of historical indications as to the timbre of the instrument, similar considerations will direct a personal aesthetic choice, based on existing knowledge.

Conclusion

It seems that the other forms of serpents appeared at the end of the eighteenth century (Serpent Droit and Serpent Piffault, a serpent in shape of an "8") having been developed for the most part for other uses than the music of the Church (military music, outdoor parades).¹⁹ The original form of the instrument is not, nevertheless, unworthy and has been utilized without interruption throughout the history of the serpent.

Fig. 7. Dimensions of mouthpieces according to Talbot's manuscript.

Mouthpieces (Talbot) measurements in inches		measurements in millimeters
Diameter	1.0	24.5
Throat diameter	.2	4.2
Tail bottom	.3	6.3
Total length	2.2	55







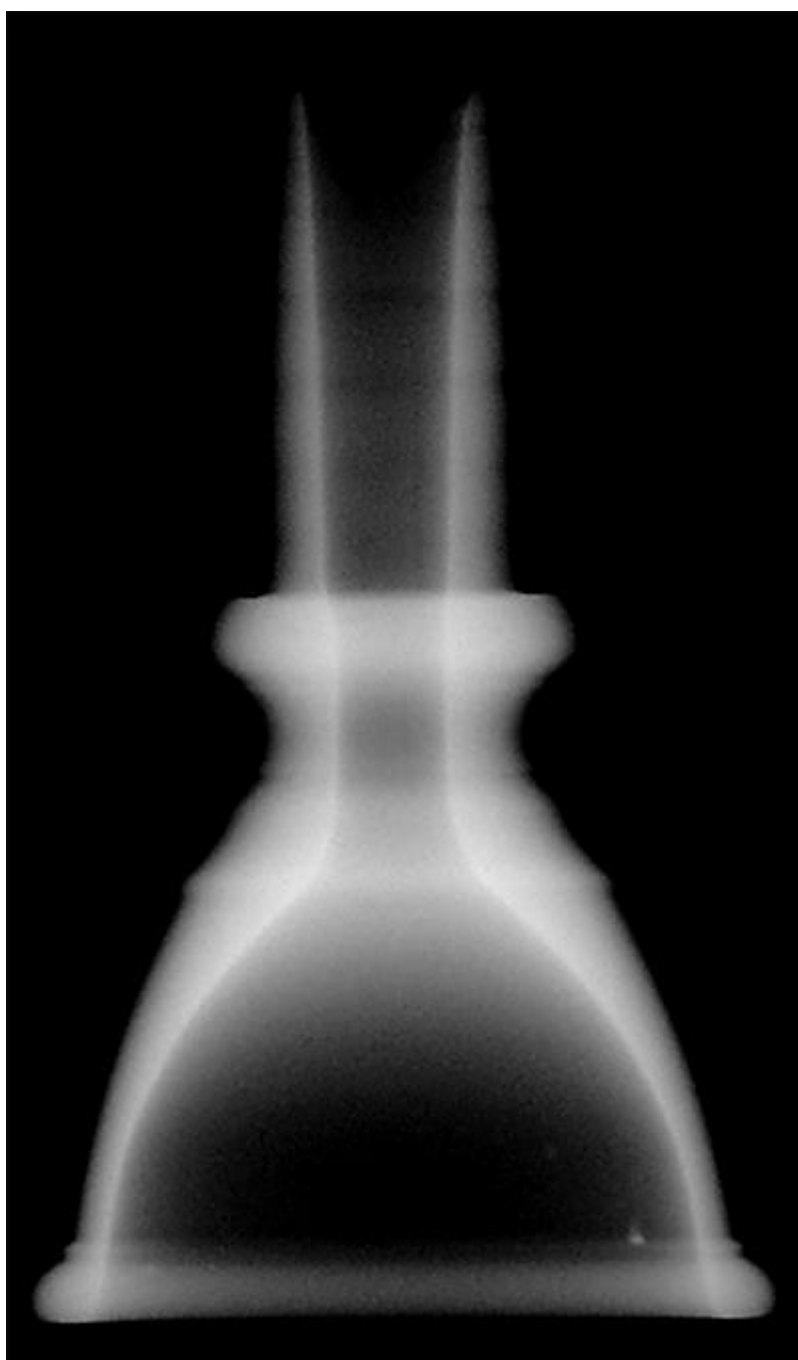


Fig. 8. Comparative table for two mouthpieces (E.01320 and E.01334).
[measurements in millimeters]

Mouthpiece	E.01320	E.01334
Form of the cup	spherical	conical
Material	ivory	ivory
Height	42.5	54.5
Length	31	33.5
Internal diameter of the cup	27	26.5
Throat width	6	5
Depth of the cup	15.5	19
Outside diameter	11	8.5

of the end of the tail
Inside diameter
of the end of the tail

9

7.5

Endnotes

1. For the uses of the serpent in the church, see Volny Hostiou, "Le serpent un instrument sacré?," *Musique d'église autour de N. Pacolat maître de psallete à Poitiers*, actes du colloque de Poitiers, 14 February 2007, Paris, 2010, Publibook, pp. 39-57. See also Cécile Davy-Rigaux, "Jouer le plainchant: le serpent à l'unisson de la voix des chantres dans la France d'Ancien Régime" in *Musique-Images-Instruments*, 14, CNRS Éditions, Paris, 2013.
2. Marin Mersenne, *Harmonie Universelle*, Paris, Sébastien Cramoisy, 1636; reprint, facsimile, with an introduction by F. Lesure: Paris, Éditions du CNRS, 1975, Vol. 3, Book V "Proposition XXIV," p. 278.
3. Apropos these other forms of serpents, see Sabine K. Klaus, "Serpent Precursors in Italy and Elsewhere; the Serpent in the Low Countries and in Germany," in *Musique-Images-Instruments*, 14, CNRS Éditions, Paris, 2013.
4. The cornett [or cornetto] is a lip-energized bass aerophone made from wood and covered in leather and played with a cup mouthpiece usually smaller than that used by the trumpet. [The original, published version of this chapter included a section, The Serpent and the Cornett Family, that described and compared the serpent to the bass cornett. This material is not included in this abridged essay.]
5. Marin Mersenne, *Harmonie Universelle*, p. 278.
6. Franck P. Bär, "Le museo Settela à Milan au XVII^e siècle," *Musique-Images-Instruments*, 2, 1996, pp. 58-85 (see particularly p. 62 text; p. 67-68 commentaries; p. 69 illustration).
7. Original version: " *Serpens harmonicus, quorum usus olim galliae familiaris Pat. Mers. Prop. XVI. Lib. 2. Instr. Harmon.* "
8. *Ibid.* p. 85, note 44.
9. François Garsault, *Notionnaire ou mémorial raisonné*, Paris, chez Guillaume Desprez, 1761, p. 641.
10. Two facsimiles of instruments E.2204 and E.2387 have been made by Stephan Berger.
11. For details concerning the Baudouin instruments, see Thierry Maniguet, "Les formes dérivées du serpent dans la première moitié du XIX^e siècle," in *Musique-Images-Instruments*, 14, CNRS Éditions, Paris, 2013.
12. A table with a synthesis of measurements is available online at the IREMUS website (<https://www.iremus.cnrs.fr/fr/collections-revues/vol-14-le-serpent-itineraires-passes-et-présents>).
13. Cf. Bruce Haynes, *A History of Performing Pitch: the Story of "A,"* Lanham, Oxford, The Scarecrow Press, 2002, see particularly pp. 97-98 and table p. 401.
14. Hector Berlioz, *Grand traité de l'instrumentation: suivi de l'Art du chef d'orchestre*, Schoenberger, 1855, republication, Paris, H. Lemoine, 1993, p. 312.
15. Louis-Joseph Francœur, *Diapason général de tous les instruments à vents*, Paris, 1772, p. 70.
16. Émile Leipp, "Le serpent un monstre acoustique," *Bulletin de Groupe d'Acoustique Musicale*, 63, October 1972, p. 12.
17. Talbot's English manuscript gives the only early mouthpiece dimensions that we can obtain. Anthony Baines, "James Talbot's Manuscript (Christ Church Library Music Ms. 1187)", *The Galpin Society Journal*, 1 March 1948, pp. 9-27. The conversion to millimeters is taken from the work of Franck Jedrzejewski, *Histoire universelle de la mesure*, Paris, Ellipses, 2002. The pied [foot] of Paris measures 1667 = 12 pouces = 144 lignes [lines] = 326.5 mm; in Imperial measures: 1 inch = 12 lines = 25.4 mm.
18. Jean-Baptiste Métoyen, *Ouvrage complet pour l'éducation du serpent*, Benny Sluchin (ed.), Paris, Éd. musicales européennes, 2002, p. 4.

19. See Thierry Maniguet, "Les formes dérivées du serpent dans la première moitié du XIX^e siècle," in *Musique-Images-Instruments*, 14, CNRS Éditions, Paris, 2013.