

Some Additional Notes on the Ancient Side Flute

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Abstract

Literary, archaeological, and iconographic testimonies attest to the side flute as an instrument that, from the 4th century BC to the 3rd century AD, played its part in the Greco-Roman musical landscape. Building on the conclusions of recent studies, this contribution aims to add to the discourse some further elements regarding both the panorama that the sources allow us to draw and the structural and acoustic features of the ancient side flute. A detailed analysis of the sources sheds light on more than a name, more than one typology, more than a performative context, for an instrument whose life extended far from the bucolic cliché. Plus, the side-blown reedless headjoint is a distinctive feature of the ancient side flute, documenting an experimental journey through acoustic effectiveness that sees eye to eye with the solutions adopted by modern craftsmanship to enhance sonority and focus.

Keywords

ancient music – ancient side flute – *plagiaulos* – *phōtinx* – *iunx* – performative situations – acoustic and constructive features – flute headjoint

From the 4th century BC, literary sources attest to a wind instrument whose familiar name was *πλαγιάυλος*. This instrument, documented in iconography until the 3rd–4th centuries AD as well, is traditionally supposed to have arrived in Greece from North Africa or Asia. The archaeological evidence is crucial to connect the dots on a side-blown flute spread throughout continental Greece, the Aegean, and Asia Minor. Some of the most distinctive features of the

instruments which emerged from the excavations consist in their cylindrical shape and a lateral mouthhole equipped with a lip plate with wings on both sides. The discovery of such a headjoint matches with literary sources attesting to a powerful sonority of the side flute, besides its similarity to other reedless instruments, and broadens its context-focus from fictional pastoral simplicity to a very skilled and very mindful urban craftsmanship.

A recent study by Psaroudakēs (2010–2011) illuminates the evidence for, and the features and diffusion of the side flute in the Greco-Roman musical landscape. Through a detailed analysis of the existing archaeological evidence sharing similar structure and characteristics and carrying out a synopsis of the side flute iconography, Psaroudakēs' analysis represents a milestone in our knowledge.¹

Nevertheless, some further aspects can perhaps be brought to light in the attempt to complete the picture. Reserving some more attention to the literary sources, we are able to pinpoint more than one typology and more than one name for the ancient side flute. Plus, bringing into play modern studies on acoustics and the most recent developments in the construction of modern headjoints, we are allowed to witness the effectiveness of ancient experiments pursuing structural solutions to improve musical performance.

1 Digging Deep into Literature

There is a common *Leitmotif* running through literature and iconography that consists in the bucolic setting: this is a conventional representation for the side flute. Alongside this cliché featuring pastoral imagery, there is a constellation of additional elements suitable to reveal the reality underlying the crystallization of poetic imagery and to move the focus towards a more extended performative panorama.

In Pseudo-Theocritus and Bion, the *πλαγιάυλος* is a favorite instrument for pastoral songs, in which the countrymen are especially skilled. Being refused by a city girl, the young Ps.-Theocritean countryman protests in his monologue reeling off his virtues. Among them, the musical skills on wind instruments play a significant part in his charming profile (T. 2). Two elements should be noticed here: the addition of the *πλαγιάυλος* among the instruments might

1 We refer here to the apparatus of figures collected and organized by Psaroudakēs 2010–2011, for the iconographic and archaeological references (521–3, figs 1–14; 544–54, figs 15–49). For another apparatus of iconographic and numismatic evidence, comprising replicas, see Scheithauer 1996, 18–23.

be one clue for the spurious nature of the *Idyll*, as it does not figure in other Theocritean works;² the βουκολίσκος is bragging about his skills at playing various types of pastoral wind instruments and sets a difference in the way of playing them, as he can attune the melody on the σῦριγξ besides being able to play musical agilities with *bravura* on an assorted set of winds. It is remarkable the way through which the skill on playing with technical virtuosity is handled in the poetic construction: κῆν ἀύλῳ λαλέω, κῆν δώνακι, κῆν πλαγιάλῳ (T. 2, v. 29). In this enumeration comprising a sort of anti-climax, we might understand that the shepherd is capable to manage the technicalities on the wind instrument of the most familiar kind, i.e. the *aulos*, either the kind provided with a reed (the δόναξ)³ or the reedless kind (the πλαγιάυλος).

As for the Ps.-Theocritus, the side flute is an instrument fit for *virtuosismi* and for a *brillante* repertoire. The pastoral character of the πλαγιάυλος with the paternity of Pan recurs in Bion (T. 3, but according to Pliny the Elder Midas in Phrygia was the father of the *obliqua tibia*).⁴ This *topos*, leading backwards to the concept of the shepherd-ποιητής,⁵ does not necessarily imply that its use was restricted to that situation though, as the *aulos* and the *kithara* are instruments fitting to the βουκολίασδα⁶ but notoriously employed in many other contexts as well. Its sound, however, loud and full, was more fitting for open-air situations than civic cultural gatherings, as Philodemus states (T. 4). In the verses of the Epicurean, the opposition between civilized and natural love – falling within the principle of the more pure and genuine the better – implies a series of parallels among flowers, music, wine, perfumes, and women. Specifically, the sound produced by the πλαγιάυλος might be here antithetical to a tune sung to the accompaniment of strings plucked with the fingers (ψάλλμα), as the side flute – able to resound with wide acoustic effect in open spaces – could appear less sophisticated or appropriate to city contexts than a string instrument. Lucian too (T. 5) follows the sylvan lead and picks

2 Palumbo Stracca 1993, 318f. in the introduction to the *Idyll* 20.

3 In this case, δόναξ could metonymically stand for the vibrating reed of the αὔλος mouthpiece (cfr. Pi. *Pyth.* 12.25): Barker 1989, 58 n. 13, 90 n. 190.

4 Plin. *HN* 7.204. Speaking of the art of divination, the discoverers of its various forms are combined by Pliny with the major inventors of the instruments of the Muses, whose roots reach into the exploration of the unknown.

5 See Gutzwiller 2006. In this fragment by Bion (T. 3), it is presented as a reverse narrative type compared to the one concerning the herdsman who, following a divine encounter, becomes a poet or a sage (*ibid.* 10–13): here, Aphrodite fetches Eros to the herdsman in order to learn from his musical wisdom.

6 The *aulos* and the *syrinx* are notoriously favorite instruments for bucolic poetry (Plat. *Resp.* 399d), also for their power at enchanting animals (Plut. *Soll. an.* 961d–e; Sext. *Emp. M.* 6.32; Porph. *Abst.* 3.22.28; Ael. *NA* 2.11.39, 12.46). See De Poli 2016, 35.

the πλάγιοι αὐλοί to shape the synesthesia of light and mild breezes breaking the silence of the woods on the Isles of the Blest while blowing with *τερπνὰ καὶ συνεχρή μέλη*.

The Story of Daphnis and Chloe by Longus (T. 9 a, b) also includes the αὐλοὶ πλάγιοι among the pastoral *instrumenta*, dedicated by senior shepherds to the Nymphs⁷ (along with milk pails, panpipes, staffs) and by Daphnis to Pan (in couple with his σὺριγξ). The theme of the shepherd – a young one – playing the πλάγιος αὐλός, recurs in the *ekphrasis* framed in the *Aethiopika* (T. 10) to portray the pastoral representation of the gem set in the ring offered as a ransom for Chariclea.⁸ In the fine Ethiopian amethyst, the young shepherd played the side flute on a rock while grazing the sheep which seemed to be listening and swaying to the melody. The pastoral scenario also prevails in iconography, as proved by the Korinthian mosaic⁹ and two coins from the city of Paneas in ancient Palestine¹⁰ (figs 1, 10, 11 Psaroudakēs). The mosaic scene, as well as the coins' image, is surprisingly close to the gem of the *Aethiopika* (T. 10): the young shepherd on (or besides) a short rock playing to the herd; the milk pail, placed towards the center of the mosaic. Heliodorus' passage is also remarkable for our purpose in as much as it blends the πλαγίαυλος with the σὺριγξ – which, in this case, would imply an instrument without a reed – and it takes over the point of music enticing animals. In this case, the melody played on the transverse flute tames the grazing animals and allows the shepherd to better manage them.¹¹ Athenaeus matches the πλαγίαυλος with the φῶτιγξ (T. 7 a), an instrument of revelry, used in Egypt and made of Libyan lotus wood (T. 7 b, c). Although Greece laid claim on the invention of the side flute as an instrument suited to the pastoral scenario and its divinities (T. 3, specifically the πλαγίαυλος), the Egyptian background recurs as the original context for this instrument. While

7 It was customary to dedicate one's work tools to the divinities at the end of professional activity: Pattoni 2005, 233 note 15; Bélis 1988, 237f. Cfr., e.g., *AP* 6.92, 16.7; also, the *anathēmata* recorded in the early 4th cent.-Hellenistic inventories: the personal items dedicated to the sanctuary by the itinerant artists in Delos (musical instrument, portrait, crown, *IG* XI/2 161B ll. 89, *ID* 442 ll. 61–62, 461 ll. 67–68, 1443A l. 137), the musical instruments dedicated in the Athenian Asklepieion (lyre and *aulos*, *IG* II² 1533 ll. 31 and 35) and in the Parthenon (plectrums, ivory and gilded lyres, *IG* II² 1460 ll. 19–21, 1463 ll. 10–11, 1424a ll. 328–329).

8 De Poli 2016, 44f.

9 The Korinthos mosaic dates to the 2nd century AD but is probably a copy of a 4th century BC painting: Psaroudakēs 2010–2011, 521.

10 The chronology for these pieces of evidence spans from the 4th BC to the 4th centuries AD: *ibid.* 522.

11 Cfr. in Longus (1.27.3), the charm of the syrinx co-herds the cows: see Gutzwiller 2006, 14–16.

preserving its Egyptian distinctive feature, the side flute might have spread out in the Greco-Roman milieu. This is the narrative context that Apuleius sets for the Sarapis pipers proceeding with *obliqui calami* held on the right while playing the traditional hymns at the festival of Isis (T. 6). Far from constituting the proof of such reception alone, it is undeniable that the Alexandrian statuette showing a player holding a long instrument extending way over the right ear (fig. 5 Psaroudakēs),¹² has more than something in common with the Isis pipers described by Apuleius.

Along the conflation of φῶτιγξ and πλαγίαυλος, the pleasant sound received through the ears was a means of enchantment for animals: the charming power of the πλαγίαυλος at keeping grazers at peace tallies with the skilled technique of mesmerizing the crabs out of their lairs through the φῶτιγξ sound (T. 8b).¹³ Nicomachus too (*Harm.* 4.1) indicates that the πλαγίαυλος and φῶτιγξ are different instruments but places them together in the family of monodic winds, meaning instruments producing one sound at a time whose pitch depends on structural features affecting the pressure of the air stream. Hesychius (T. 11) goes further in trying to describe the φῶτιγξ and analogizes it to the σῦριγξ (this stands also for the πλαγίαυλος, see above and T. 10), the *lōtos-aulos*,¹⁴ and even to the σάλπιγξ, possibly grouping it with other wind instruments played without a reed.¹⁵ As for the σάλπιγξ-like shape (εἶδος),¹⁶ the resemblance might also lie with the tube of the φῶτιγξ, slightly bell-shaped towards the end. The possibility that, in some cases, the side flute – be it φῶτιγξ

12 See also Hickmann 1952 (but the early debate suffers from vagueness).

13 That fishes were attracted by the sound of the flute is still a Sicilian folktale (see Lelli 2017, 2891 n. 10 *ad* Plut. *Soll. an.* 2891, but notes' numbers 9–10 are misleadingly placed in the text).

14 Cfr. Hesych. φ 1135 Cunn. <φῶτιγξ>· †φλογιός† αὐλός (see note 51). For the λωτός as a “Libyan” transverse flute, see also Poll. 4.74. But λωτός can also designate a standard αὐλός, not the transverse flute: e.g. Eur. *Hel.* 171. See Barker 1989, 268 n. 38 and, more specifically, 2018: according to the author’s compelling reconstruction, Euripides refers to a side-tradition of the myth whenever he uses the expression Libyan λωτός standing for αὐλός. In this version of the tale, the invention of the αὐλός goes back to Athena whilst involving Perseus, the killing of the Libyan Gorgons with which she assisted, and the origin of the *Polykephalos nomos* (e.g., Pind. *P.* 12, Hdt. 2.91, Eur. *Ba.* 990, Ar. *Ra.* 477). Barker’s reconstruction aligns with the typical Euripidean use of semantic expressions referring to a deep significance and to the less explored mythical versions. Returning to the actual λωτός, it is worth asking though why it is flanked to the side flute by both Athenaeus (T. 7c) and Pollux (4.74): if there is no chance the λωτός was a side flute itself, might this conflation/confusion mainly stem from the material (sometimes) used for both instruments, or also from similar shape, or dimensions, or even sound?

15 West 1992, 113.

16 Accepting ὡς εἶδος σάλπιγγος, see note 51.

or πλαγίαιλος (T. 11) – could have the shape of a gentle bell at the exit end, is suggested by the so-called Koilē flute (fig. 31 Psaroudakēs). Although the σάλπιγξ bell was of a significantly larger size,¹⁷ the comparison of the φωτίγξ with the εἶδος σάλπιγγος might find in the flared exit its explanation.¹⁸ As for the σῦριγξ, the reference might likely be to the μονοκάλαμος, a single-stem flute with finger holes,¹⁹ whose name was also ἰϋγξ, like the bird (T. 12a). The wry-neck – Aelianus explains (T. 8a) – is able to imitate the πλάγιος αὐλός and, when in love, the male sings like the Theocritean pastoral melodies.²⁰ Standing by the ornithological parallels,²¹ it is also worth noticing that the φωτίγγιον, conceivably a φωτίγξ of smaller size (T. 7b), was the name for a bird (T. 12b).²² The same way of naming a bird and the instrument with its diminutive might hint at its small size and at the warbling sound produced, just like a twittering little bird (like the modern piccolo). Some of the small instruments featured in the images of side flute players (figs 4, 8 Psaroudakēs) may in fact represent the φωτίγγιον.

2 More than One Context, More than One Kind

Various examples of side flutes arose from the archaeological investigations in Halikarnassos, Delos, Korinthos, and in the Koilē road of Athens (between the Athenian hills of the Pnyx and Philopappos), spanning throughout the 3rd BC and the 1st centuries AD.

The instruments from Halikarnassos and Athens come from Hellenistic funerary contexts (the necropolis of Budrum and the cemetery of Koilē).²³ These

17 E.g., the copper example of σάλπιγξ on display at the Archaeological Museum of Lamia (2nd half of the 4th century-mid 2nd century BC, inventory no. M 7953/M 7905α-δ/M 8054 α-β).

18 The same feature could be assumed also for the “Athens *aulos*” (which might be recognized as a side flute, figs 33–34 Psaroudakēs), and a fragment from Jerusalem (fig. 35 Psaroudakēs).

19 The μονοκάλαμος σῦριγξ, invented by Hermes or certain Maides, living in Thracia at the middle course of the river Struma: Euphorion fr. 182 van Groningen = Ath. 4.184a.

20 Ael. NA 15.19.

21 It is conceivable that such parallels also have to do with the derivation of some instruments from birds’ bones (as in the prehistoric era), besides the resemblance between their sounds – instrumental and vocal – and birdsong, which is a typical *topos* of ancient Greek literature. I owe this suggestion to Prof. Rocconi.

22 Cfr. Ath. 4.182e.

23 To be precise, the Halikarnassos burial is non-better-specified Hellenistic whilst the Koilē one dates between the 1st BC and the 1st centuries AD: Bélis 1988, 235; Psaroudakēs 2010–2011, 523.

side flutes were offerings belonging to the deceased and represented a part of his life. In particular, the Halikarnassos instrument, made of bronze, wood, and ivory, is a high-quality item, which reasonably finds its *ratio* in belonging to a skilled or a professional musician valuing this particular object very much. The side flute from Korinthos comes from the South Stoa,²⁴ an urban context that we can track also for the Delian example, found in one of the *ergastēria* of musical instruments dated to the 1st quarter of the 2nd century BC.²⁵ As for the archaeological testimonies, we have a context very different from the bucolic one to which we are accustomed in literature and iconography. Another element can offer further support in expanding our perspective. The Thebai floor (ca. 200 BC, fig. 3 Psaroudakēs), painted with a man playing the side flute on a *bēma* in the typical crossed-legged position and with a crown and a flask of wine(?) in the background, might suggest a music contest and its prize. This representation would imply that either the side flute, emancipated from the pastoral milieu, was an instrument regularly played at (certain, more popular?) Hellenistic ἀγῶνες or the elements assembled together in the floor painting symbolized an ideal pastoral ἀγών as in literary fiction. But what if literary fiction actually matched with real agonistic situations where professional players performed the pastoral cliché with an instrument, the side flute, typically used for such “musical sketches”? The fact that the archaeological discoveries and iconography allow us to envisage an agonistic context and an urban milieu for an instrument whose refined examples suggest the owners’ professionalism, cannot be neglected and must be associated with the leading pastoral scenario along with the “exotic” and sacred one, the musical apparatus of Egyptian cult (T. 6).

The archaeological discoveries also evidenced that the side flute was fitted with a lip plate. Into the headjoint section, a prismatic platform with prominent walls was carved longitudinally to the axis of the flute, with a mouthole centered between the edges.²⁶ Accordingly, the player held the instrument on

24 *Ibid.* 527 n. 31; Bélis 1988, 243–7; Papadopoulou 2003; Karvonis 2008, 176. Thanks to the discovery of several fragments of instruments and bones, two workshops have been identified in Delos, one on a street east of the Apollonion *peribolos* and the other in the Granite House. See Bélis (*loc. cit.*), for the hypothesis that the reason for the discovery of several unfinished objects depends on the fact that craftsmen took only the most valuable items with them during one of the sacks of the island, either by Mithridates in 88 BC or by the pirates in 69 BC.

25 Dakoura-Bogiatzoglou 2009; see Marchiandi 2011 for the description of the necropolis.

26 Psaroudakēs 2010–2011, 527. Because the ancient side flute was a reedless wind instrument, the air dispersion over the edge is significant so that the lips themselves were supposed to compensate for the absence of a reed, modulating shape and direction in order to play in different registers and with a variety of dynamics.

the right side.²⁷ Hence, the iconographic sources (as in the synopsis gathered by Psaroudakēs) together with the archaeological discoveries, point towards a reedless instrument provided with a side lip plate. The literary sources (T. 10–11) tend to match the πλαγίαυλος and the φῶτιγξ with the σῦριγξ and the σάλπιγξ, whose lack of a reed allows us to point towards the side flute attested in the archaeological and iconographic sources rather than an αὐλός with an oblique reed, which might also be documented. In fact, we cannot neglect that there might also be evidence of αὐλοί with a reed slanted transversely into the hole closest to the upper end, as Pseudo-Aristotle (T. 1) describes the blurred and soft (μαλακή) sound produced by αὐλοί equipped with γλώσσαι πλαγίαι, as opposed to the συγκροτωτέραι γλώσσαι,²⁸ which instead were tougher and more tightly stuck into the hole and thus produced a clearer and more intense sound. In the frame of this comparison, it seems more likely that γλώσσαι are double reeds fitting the pipe in a more or less tight way.²⁹ According to this interpretation of the Aristotelian passage, we have evidence of a further typology of an instrument that, though transversally oriented as a side-flute, preserved the *embouchure* technique of the αὐλός.³⁰ So, aside from the “intermediate typology” of an *aulos* with γλώσσαι πλαγίαι, we are allowed to recognize some proper side flutes, identified in the sources as πλαγίαυλος – φῶτιγξ.

The πλαγίαυλος/πλάγιος αὐλός should be the more familiar kind of side flute, with a loud and wide sound, fit for open-air performances and endowed with a proper repertoire of bucolic arias and sacred canons (αὐλήματα, *familiar modulus* T. 5, T. 6). The poor sonority of the Aristotelian instrument with oblique reeds is another reason for which the match with a proper resounding side flute is unlikely. As for the φῶτιγξ, it had a sort of exotic nature, coming from Egypt – and thus possibly sharing some characteristics with the λωτός³¹ – and being current in Syria. As for its conflation with the πλαγίαυλος, we reckon they were very similar instruments but probably not the same, as Nicomachus

27 This feature marks a structural divergence from the *aulos*, whose mouthpiece was placed atop the instrument and obliged the *aulētēs* to use a frontal position.

28 Even in the case of the *lectio* ταῖς σκληροτέραις γλώτταις (instead of συγκροτωτέραις γ., see T. 1), the comparison would exist between tougher or undispersive *glossai* (material/position) and oblique hence dispersive ones (position). Cfr. Vitr. 10.8.4: pipes having *lingulae*.

29 Discussing this problematic passage, Barker 1989, 103 n. 17 relates it to the *plagiaulos* and pairs it with Thphr. *Hist. plant.* 4.2.4–5. συγκροτωτέραι γλώσσαι and γλώσσαι πλαγίαι are recognized as two kinds of double reed, with elements tightly closed together and thus producing a projected sound or more spaced one from another for a softer sonority.

30 While West (1992, 92, 113) recognizes the possibility of two typologies of flute, Landels (1999, 71f.) acknowledges one transverse flute without a reed. See also Grandolini 2010, 957.

31 See above note 14.

(*Harm.* 4.1) mentions and differentiates the both of them within the family of monodic winds.³² As well as the others of the wind family, to the πλαγιάυλος and the φωτίγξ belonged certain characteristics about dimensions and sound. According to Nicomachus, there is a reverse relation between length proportions and high pitch, as the longer the wind instruments are the lower their sound is in pitch. As regards to proportion and register, whilst strings produce higher sounds when strings have greater tension and vice versa, the winds able to produce higher and bright sounds are the shortest.³³ In the end, as for Nicomachus, the direct relationship between dimension and pitch leads back to number, inasmuch as the greater and the lowest sounds relate to the length of the tube and how stretched are the chords. This concept leads us to introduce the possibility that there were also side flutes of small dimensions called φωτίγξια, used in festive occasions and sounding like a bird (T. 7b; T. 12b), as well as the ὕγγες which, although producing a sound similar to the πλάγιος αὐλός, need to be identified as single-piped syringes (T. 12a).

3 Organological and Acoustic Correspondences to the Modern Flute³⁴

The Knosos mosaic (2nd century AD, fig. 4 Psaroudakēs)³⁵ shows a player holding a side flute equipped with an *embouchure* significantly raised, as do the mouthpiece examples which have emerged thus far from the archaeological excavations in Delos, Korinthos, and Halikarnassos (figs 22–23 Psaroudakēs and Bélis 1988, 236 fig. 2). Such a reedless headjoint arranged with a lip plate is one distinctive feature of the ancient side flute, by virtue of which it has been

32 Nicom. *Harm.* 4.15–19 μέσα δ' αὐτῶν καὶ οἷον κοινὰ καὶ ὁμοιπαθὴ τὰ τε μονόχορδα φαίνεσθαι, ἃ δὴ καὶ φανδούρους καλοῦσιν οἱ πολλοί, κανόνας δ' οἱ Πυθαγορικοί, καὶ τὰ τρίγωνα τῶν ἐντατῶν καὶ τοὺς πλαγιάυλους μετὰ τῶν φωτίγγων, ὥς προῖαν ὁ λόγος δηλώσει.

33 According to Nicomachus (*Harm.* 28–33), another relevant variable for wind instruments is the pipe diameter, as they sound lower and blurry when the tube is wider, possibly because the air moves slowly trying to fill in: ἀνάπαλιν δὲ τῶν ἐμπνευστῶν αἱ μείζονες κοιλιώσεις καὶ τὰ μείζονα μήκη νωθρόν καὶ ἔκλυτον. εἰ γὰρ πολλῇ [λειποτονήσαν] παραπομπῇ τὸ πνεῦμα ἐξήσιν εἰς τὸν περὶ ἀέρα καὶ δυσσεμφάτως αὐτὸν πλήσει καὶ κινεῖ, καὶ βαρὺς οὕτως ὁ φθόγγος γίνεται. Cfr. also [Arist.] *Aud.* 800b.

34 As for the aspects regarding the acoustic and constructive principles of modern flutes, I am deeply grateful to Luca Bellini (Principal Flute of the Italian Police Orchestra), Franco Luisi (“Straubinger Certified Flute Repairer”), Eugenio Righi (Flute Maker at the leading brand “Brannen Flutes Flutemakers Inc.”), Andrea Pomettini (headjoint artisan), and Marco Maida (owner of “Flauti Briccialdi Italia”), for kindly sharing their constructive and technical knowledge and for providing bibliographical support.

35 In Table 1 fig. 14 Psaroudakēs, it seems to occur a chronological *lapsus* for the Knosos mosaic, 2nd cent. AD (Hadrian age).

associated with the σῦριγξ and the σάλπιγξ and its sonority was suitable for open-air situations, for agonistic and sacred occasions.

The lip plate is a structural feature whose purpose was to increase the depth of the pipe at the level of the mouthhole, in order to enhance the sound resonance, notably in the lower register.³⁶ Recent studies showed that adopting a lip plate, and thus enlarging the depth of the mouthhole,³⁷ produces the same effect as blowing across the opening of an empty bottle.³⁸ This capacious space of resonance allows air to develop its oscillatory flows and sound to take a wide and round shape, so that the first octave is greatly expanded. As a side effect, the presence of a lip plate also allows a more ergonomic position and offers to the player a clear reference point for the placement of the lips.³⁹ The adoption of a forerunner lip plate for the side flute seems to suggest that, in ancient times, craftsmen were aware of this acoustic principle and skillfully arranged technical solutions to implement it. Whilst over the centuries this expedient was lost together with sound width,⁴⁰ in the recent history of flute-making the crucial function of the lip plate was discovered anew in a constant research for wider and more projected sonorities.⁴¹

36 Böhmer 1908, 23f.; Steinkopf 1983, 18; Cooper 1989.

37 In modern flute craft, a riser (also called chimney) is employed as the part of the head-joint connecting the lip plate to the tube.

38 Benade 1990, 489f.; Pomettini 2017a, 58f.

39 The raised lip plate acts as a cradle to the lips, bringing them into the optimal position. It also creates a sort of path directing the air stream to the center of the edge and thus brightening the tone.

40 In Renaissance and Baroque music, wooden flutes had neither lip plates nor ridges. The lip plate was replaced by a small, round hole carved on the longitudinal axis of the pipe. Listening to replicas of the *flutes d'Allemagne* or *traversières* – or even to the South-Asian Bansouri, sharing the same constructive principle – the sound capacity is limited and the timbre is thin, although the wall thickness (3–4 mm for the wooden baroque flutes, against 0,32–0,36 mm of the modern gold ones) is supposed to partially compensate for the absence of a lip plate and the minor density of the material (according to Böhmer himself and to many flute brands nowadays, a thicker wall contributes to the production of a darker and more powerful sound).

41 The lip plate started to be used again in the 19th century by Theobald Böhmer, father of the modern keyed flute. Contextually, the constant integration of the flute section in full symphony orchestras and the new acoustic needs – from Romantic to contemporary music – has led the flute makers to experiment for a more effective sound. The adoption of a lip plate has therefore become essential for adequate sound production and, as further proof of this concept, most of the leading flute makers use even higher lip plates for the modern subcontrabass, contrabass, bass, and alto flutes – special instruments of the flute family, playing from three octaves to a fifth lower than the soprano – and for those soprano flutes that are characterized by a darker timbre – as the Sankyo and the German instruments – with the aim of increasing the sound volume, especially in the low register. See Pomettini 2017b, 60.

Observing the Halikarnassos and Delos flutes (figs 21–22, 25–26 Psaroudakēs), a further feature can be remarked regarding the internal rounded rim of the mouthole, whose downstream side – underlying the player’s lips – is slightly bent while the outward part is vertical. Within the panorama of modern headjoint craftsmanship, we surprisingly detect the very same arrangement in chimney making. The downstream side, which is partially covered by the embouchure, is slightly curved and the outward part is vertical and sharp, in order to obtain a more responsive sound attack. Looking through an assembled mouthole, the correspondence between modern and ancient flute-making concerning this feature is visible and it appears even clearer when observing the modern chimneys’ molds.⁴²

Relevant features of the ancient side flute headjoints are also the walls on each side of the mouthole, with the purpose of improving the tone focus.⁴³ More specifically, this organological improvement conceivably arose from the need to limit air dispersion on the sides, supporting the flutist at funneling most of the air flow into the mouthole and, as a direct effect, to reach a better timbre and a larger tone.⁴⁴ The effectiveness of these lateral “wings” is confirmed by the recent history of the flute. Böhm-system flutes attest to the use of lateral wings since on the 19th century, with a large diffusion especially in Germany.⁴⁵ In the most recent decades, top-flute and headjoint makers adopted the concept of ridges, applying it to standard and special instruments [Figure 1].⁴⁶

42 In modern bass and soprano side flutes, this expedient was adopted also for the external surface of the lip plate. In some cases, the shape contrast between an ergonomically curved downstream side and an almost upright outward part is remarkable (see, for example, some models of leading brands as the Mönnig Flutes and the Sankyo “RT”). A vertical outwards part of the lip plate named “fall off” supports at producing a pure and precise sound *incipit* and is an essential feature of the bass and contrabass flutes.

43 Psaroudakēs 2010–2011, 527.

44 For an acoustic description of this feature, see Lazzari 2003, 415; for an empirical and constructive point of view, see the Sir J. Galway blog (July 10th, 2004), DOI: <https://sirjamesgalway-blog.tumblr.com/post/42034701670/angels-who-play-with-wings>.

45 These wings constituted the main feature of the so-called *reform platte*, usually made of ebonite and screwed over the headjoint, so that they could be easily removed and substituted whenever necessary (Pomettini 2017c, 56f.). The *reform platte* headjoints were highly appreciated for the generous and round sonority they were able to produce, particularly in the first octave, but in the early 20th century their use suffered a sudden interruption because of the French School’s Golden Age, not keen on adopting features colliding with its ideal of a diaphanous and pure sound.

46 The Muramatsu “Tsubasa”, the Lafin “Adler Wings”, the Sankyo “High Wave”, and others. Regarding the special instruments of the flute family, relevant applications of this feature can be detected in several models (e.g. the Hammig, Bulgheroni, Burkart piccolos, some Rudall Carte bass flutes, and Eva Kingma bass and double bass flutes).

This recent revival has led flute makers to trial further developments that in some cases look just like the shape of the ancient side flute wings. [Figure 2].



FIGURE 1 Subcontrabass flute, headjoint detail
COURTESY OF A. POMETTINI



FIGURE 2
“Muramatzu GX” wing lip
COURTESY OF A. POMETTINI

More than two millennia apart, ancient side flutes and modern transverse flutes show correspondences in specific technical arrangements that appear as the product of a complex organological exploration pursued by skilled instrument makers. Of course, it is unlikely that any of the modern flute makers took inspiration from the ancient side flutes. Nevertheless, the same path walked by the artisans in crafting the instruments cannot be ignored, as it attests to accurate studies on acoustics, with precise direction and purpose. The features debated above seem to point towards a main common target, a wide-ranging sound whose *ambitus* has been proved almost as large as the modern one by the replicas built on the basis of the “Koilē πλαγίαυλος”, extending for two octaves and a sixth when overblowing.⁴⁷ Plus, such characteristics embed a number of “side-effects” that may include better comfort for the player and the enhancement of the lower register.

Throughout the modern history of the transverse flute, the re-introduction of lip plates and wings matched with a shift in musical language,⁴⁸ whenever it abandoned the concept of an ethereal flute tone and required a heavier sonority with a huge range of dynamics. This was achieved by adopting constructive ideas pointed at increasing the sound and at controlling the air dispersion, all solutions that recall those used by the Hellenistic artisans.

All that considered and far from attempting an “attualizzazione dell’antico” (using a L.E. Rossi expression, recently recalled to my mind by R. Nicolai), we might question the purpose for which the development of ancient headjoints was so focused and successfully aimed at increasing sound. We might suppose that the reason for such an arrangement was in the musical occasions comprising performances on the side flute: a flute-player needed a generous sonority in order to stand over an open-air venue or even an *obbligato* in ensemble. Otherwise, we could envisage a stylistic trend, taking advantage of the organological improvement of the headjoints to nod to the aesthetic preference for a darker and deeper sound on the ancient side flute.

4 Final Remarks

From both iconography and literary sources, we gather that the side flute was an instrument whose pastoral nature was its dominant character, hanging

47 Terzès 2020: following to the replica produced by Psaroudakēs 2010–2011 and to a new analysis of the finding, this new study provides updated measurements and a remarkable set of note series.

48 Until the Romantic age, the repertoire did not urge the flutist to display a large sonority in order to emerge for a solo, since the accompaniment in chamber music frequently consisted of a harpsichord or a “basso continuo”.

among the shepherds' tools and fitting to the βουκολίασδα. We are aware that the πλαγίαυλος was suitable for *virtuosismi* and had a loud sound especially in the first octave, able to stand out in open spaces or even in competitive situations. We could also gather that the bucolic cliché featuring the side flute is one side of the coin as this instrument fitted also in agonistic and urban contexts and was performed by skilled players.

There is a returning circle in the side flute terminology, implying a similarity (more than a perfect match) in identification. Of course, the strongest conflation stands between πλαγίαυλος and φῶτιγξ, given the Egyptian/Libyan background and the enchanting power over animals. The analogy with the σῦριγξ (μονοχάλαμος) is a crucial element that focuses attention on the “pastoral cage” enclosing the representation of the side flute and on the absence of reeds: both the πλαγίαυλος and φῶτιγξ are associated with the σῦριγξ, as well as the ῥῦγξ. These instruments altogether come full-circle through the ornithological conflation recalling sound and small size. The possibility that there was a shorter and high-pitched version of the φῶτιγξ (and the πλαγίαυλος?) is also suggested by the sources. The study on sound effectiveness is proved by the side flute examples which have arisen from the archaeological excavations: the constructive solutions in making a headjoint, equipped with lip plate and wings, a skilled tool for a projected sonority, allow us to envisage an instrument able to stand out even in the most acoustically demanding circumstances.

Acknowledgments

This paper stems from the project PTANOIS POSIN, which has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 843186. I am grateful to Professors S. Psaroudakēs and E. Rocconi for sharing their wisdom on this matter and to the anonymous reviewers for their valuable comments and remarks.

Textual Apparatus

T. 1 [Arist.] *Aud.* 801b. 31–40:

δῆλον δέ· τὸ γὰρ τελευταῖον αἱ φωναὶ πᾶσαι γίνονται κωφαί, τοῦ ἀέρος ἤδη διαχωρόμενου. δῆλον δ' ἐστὶ κατὰ τῶν αὐλῶν. τὰ γὰρ ἔχοντα τῶν ζευγῶν [δευτέρων B.] τὰς γλώττας πλαγίας μαλακωτέραν μὲν ἀποδίδωσι τὴν φωνήν, οὐχ ὁμοίως δὲ λαμπράν· τὸ γὰρ πνεῦμα φερόμενον εὐθέως εἰς εὐρυχωρίαν

ἐμπίπτει, καὶ οὐκέτι φέρεται σύντονον οὐδὲ συνεστηκός, ἀλλὰ διεσκεδασμένον. ἐν δὲ ταῖς συγκροτωτέραις [σκληροτέραις *B.*] γλώτταις ἢ φωνὴ γίνεται σκληροτέρα καὶ λαμπροτέρα, ἂν πίεσῃ τις αὐτάς μάλλον τοῖς χεῖλεσι, διὰ τὸ φέρεσθαι τὸ πνεῦμα βιαιότερον.

“This is obvious; for ultimately all sounds fade as the air becomes dispersed. This is true also in the case of flutes. For those which have a sloping reed in their mouthpieces produce a softer sound, but one not equally clear; for the breath travelling strikes directly into the wide open space, and is no longer under tension and compressed but scattered. But in the case of tighter fitting reeds the voice becomes harder and clearer, if one compresses the lips more tightly, because the breath travels with more violence”. (Transl. W.S. Hett)

T. 2 [Theoc.] 20. 28–29:

ἀδὺ δέ μοι τὸ μέλισμα, καὶ ἦν σύριγγι μελίσδω,
κῆν αὐλῷ λαλέω, κῆν δῶνακι, κῆν πλαγιαύλῳ.

“Sweet also is my melody, either I attune to the panspipe or I twitter with the *aulos* or the shepherd's pipe or the side flute”.

T. 3 Bion fr. 10 Gow:

ὥς λέγε· χᾶ μὲν ἀπήλθεν, ἐγὼ δ' ὅσα βουκολιάσδον,
νήπιος ὥς ἐθέλοντα μαθεῖν, τὸν Ἔρωτα δίδασκον,
ὥς εὔρεν πλαγίαυλον ὁ Πάν, ὥς αὐλὸν Ἀθάνα,
ὥς χέλυν Ἑρμάων, κίθαριν ὥς ἀδὺς Ἀπόλλων.
ταῦτά νιν ἐξεδίδασκον·

“With these words she (scil. Cypris) went away and assuming in my innocence that he did want to learn, I (scil. the herdsman) set about teaching Eros all my knowledge of country music: I taught him how Pan invented the cross pipe, Athena the double pipe, Hermes the lyre of the tortoise-shell, and sweet Apollo the box lyre”. (Transl. N. Hopkinson)

T. 4 Philodemus, *AP* 11.34:

Λευκοῖνους πάλι δὴ καὶ ψάλματα καὶ πάλι Χίους
οἶνους καὶ πάλι δὴ σμύρναν ἔχειν Συρίην
καὶ πάλι κωμάζειν καὶ ἔχειν πάλι διψάδα πόρνην

οὐκ ἐθέλω· μισῶ ταῦτα τὰ πρὸς μανίην.
 ἀλλὰ με ναρκίσσοις ἀναδήσατε καὶ πλαγιαύλων
 γεύσατε καὶ κροκίνοις χρίσατε γυῖα μύροις
 καὶ Μιτυληναίῳ τὸν πνεύμονα τέγξατε Βάκχῳ,
 καὶ συζεύξατέ μοι φωλάδα παρθενικήν.

"I wish no garlands of white violets again, no tunes on the strings again, no Chian wine again, no Syrian myrrh again, no reveling again, no having a poisoning harlot again. I hate these things that lead to madness. But bind me with garlands of narcissus and let me taste the side flute, and anoint my limbs with saffron unguents, wet my throat with wine of Mytilene and couple a shy maiden with me".

T. 5 Luc. *VH* 2.5:

... καὶ αὔραι δέ τινες ἡδεῖαι πνέουσai ἡρέμα τὴν ὕλην διεσάλευον, ὥστε καὶ ἀπὸ τῶν κλάδων κινουμένων τερπνὰ καὶ συνεχῇ μέλη ἀπεσυρίζετο, εἰκοτά τοῖς ἐπ' ἐρημίας αὐλήμασι τῶν πλαγίων αὐλῶν.

"... and pleasant breezes gently blowing stirred the woods, so that from the moving branches a delightful and unbroken melody whistled aloud, resembling the arias of the side flutes in desert places".

T. 6 Apul. *Met.* 11.9:

ibant et dicati magno Sarapi tibicines, qui per obliquum calamus ad aurem porrectum dexteram, familiarem templi deque modulum frequentabant.

"There also came pipers dedicated to mighty Sarapis, who, on transverse pipes extending past the right ear, repeated the traditional canon of the god and his temple".

T. 7 Athenaeus

a 4. 175 e–f:

Ἰόβας μὲν γὰρ ἐν τῷ προειρημένῳ συγγράμματι Αἰγυπτίους φησὶν λέγειν τὸν μόναυλον Ὀσίριδος εἶναι εὖρημα, καθάπερ καὶ τὸν καλούμενον φώτιγγα πλαγιαύλον, οὗ καὶ αὐτοῦ παραστήσομαι μνημονεύοντα ἐλλόγιμον ἄνδρα. ἐπιχωριάζει γὰρ καὶ ὁ φώτιγξ αὐλὸς παρ' ἡμῖν.

"In the essay I mentioned just now, Juba (*FGrH* 275 F 16) says that the Egyptians call the *monaulos* an invention of Osiris, as they do also the *plagiaulos* known as the *phōtinx* for which, too, I will bring a very illustrious author recording that. We, in fact, use to call the *phōtinx* as the *aulos*".

b 4. 176b:

Ποσειδώνιος δ' ὁ ἀπὸ τῆς στοᾶς φιλόσοφος ἐν τῇ τρίτῃ τῶν ἱστοριῶν διηγούμενος περὶ τοῦ Ἀπαμέων πρὸς Λαρισαίους πολέμου γράφει τάδε· 'παραζωνίδια καὶ λογχάρι' ἀνείληφότες ἰῶ καὶ ῥύπῳ κεκρυμμένα, πετάσια δ' ἐπιτεθειμένοι καὶ προσκόπια σκιὰν μὲν ποιοῦντα, καταπνεῖσθαι δ' οὐ κωλύοντα τοὺς τραχήλους, ὄνους ἐφελκόμενοι γέμοντας οἴνου καὶ βρωμάτων παντοδαπῶν, οἷς παρέκειτο φωτίγγια καὶ μοναύλια, κώμων οὐ πολέμων ὄργανα.' οὐκ ἄγνοώ δὲ ὅτι Ἀμερίας ὁ Μακεδὼν ἐν ταῖς Γλώσσαις τιτύρινόν φησι καλεῖσθαι τὸν μόναυλον. ἴδε ἀπέχεις, καλὲ Οὐλπιανέ, καὶ τὸν τῆς φωτίγγος μνημονεύοντα.

b "The Stoic philosopher Poseidonius, in the third book of his *Histories* (fr. 86 Theiler = *FGrH* 87 F 2), where he is describing the war of the Apameans against the Larisseans, writes as follows: 'They picked up daggers and bayonets covered in rust and dirt: they put on hats and visors, which gave shade but did not prevent their throats from breathing: they dragged along donkeys laden with wine and food of all sorts, among which were packed *phōtingia* and *monaulia*,⁴⁹ instruments of revelry, not of war'. And I know too that Amerias of Macedon in his *Dialects* says that the *monaulos* is called 'tityrinus'. Here then, noble Ulpianus, you have someone who mentions the *phōtinx*".

c 4. 182d–e:

οἱ δὲ καλούμενοι λώτινοι αὐλοὶ οὗτοί εἰσιν οἱ ὑπὸ Ἀλεξανδρέων καλούμενοι φωτίγγες. κατασκευάζονται δ' ἐκ τοῦ καλουμένου λωτοῦ· ξύλον δ' ἐστὶ τοῦτο γινόμενον ἐν Λιβύῃ.

"The ones called '*lotus-auloi*' are those that the Alexandrians call *phōtinges*. They are made of what is called '*lotus*', a wood that occurs in Libya". (Transl. Barker 1984, slightly modified)

49 *Phōtingia* and *monaulia* are diminutive forms. As for Barker, they do not necessarily imply a smaller size of the instrument. In Yonge (Loeb Classical Library) translation, instead, they are "little *phōtinges* and little *monauloi*".

T. 8 Aelianus

a NA 6.19:

ἡ κίττα δ' οὖν καὶ τῶν ἄλλων φωνημάτων μιμηλότατόν ἐστι, τοῦ δὲ ἀνθρωπικοῦ πλέον. ἰδιάζει δὲ ταῖς μιμήσεσι τῶν τοιούτων ὁ τε ἄνθος καλούμενος καὶ ἡ σάλπιγξ καὶ ἡ ἵυγξ καὶ ὁ κόραξ. καὶ ὁ μὲν ἄνθος ὑποκρίνεται χρεμέτισμα ἵππου, τὴν σάλπιγγα δὲ ἡ ὁμώνυμος, καὶ τὸν πλάγιον ἡ ἵυγξ αὐλόν· βούλεται δὲ τῶν ὀμβρῶν μιμεῖσθαι τὰς σταγόνας ὁ κόραξ.

“Now the jay can imitate all other sounds but especially the human voice. And the buff-backed heron, as it is called, and the *salpinx* and the wry-neck and the raven are peculiarly fitted to imitate the following sounds. The buff-backed heron represents the neighing of a horse; the *salpinx*, the instrument whose name it bears; and the wryneck, the crossflute; while the raven tries to imitate the sound of raindrops”.

b NA 6. 31

Οἱ θηρώντες τοὺς παγούρους ἐπ' αὐτοὺς ἐμηχανήσαντο τὴν μουσικὴν δέλεαρ. φωτιγίῳ γοῦν (ὄνομα δὲ ὀργάνου τοῦτο) αἰροῦσιν αὐτούς. οἱ μὲν γὰρ ἐν τοῖς φωλεοῖς δεδύκασιν, οἱ δὲ ὑπάρχονται τοῦ μέλους. καὶ ἀκούσαντες οἱ πάγουροι πείθονται ὡς ὑπὸ τινος ἵυγος προελθεῖν τῆς θαλάμης, εἴτα ὑπὸ τῆς ἡδονῆς ἐλκόμενοι προΐασι καὶ ἔξω τῆς θαλάττης, οἱ δὲ αὐλοῦντες ἐπὶ πόδα ἀναχωροῦσι. καὶ ἐκεῖνοι ἔπονται καὶ ἐπὶ τῆς γῆς ἀλίσκονται.

Those who hunt crabs have hit upon the device of luring them with music. At any rate they catch them by means of a *phōtinx* (this is the name of an instrument).⁵⁰ Now the crabs have gone down into their hiding-places, and the men begin to play. And at the sound, as though by a spell, the crabs are induced to quit their den, and then captivated with delight even emerge from the sea. But the flute-players withdraw backwards and the crabs follow and when on the dry land are caught. (Transl. A.F. Scholfield)

50 Cfr. Plut. *Soll. an.* 961d–e ἡδονῆς δὲ τῷ μὲν δι' ὧτων ὄνομα κήλησίς ἐστι τῷ δὲ δι' ὀμμάτων γοητεία· χρώνται δ' ἑκατέρους ἐπὶ τὰ θηρία. κηλοῦνται μὲν <γὰρ> ἔλαφοι καὶ ἵπποι σύριγξ καὶ αὐλοῖς, καὶ τοὺς παγούρους ἐκ τῶν χηραμῶν ἀνακαλοῦνται βιαζόμενοι ταῖς φώτιγξι, καὶ τὴν θρίσσαν ἄδόντων καὶ κροτοῦντων ἀναδύεσθαι καὶ προΐεναι λέγουσιν.

T. 9 Longus Sophista

a 1.4.3

ἀνέκειντο δὲ καὶ γαυλοὶ καὶ αὐλοὶ πλάγιοι καὶ σύριγγες καὶ καλαύροπες, πρεσβυτέρων ποιμένων ἀναθήματα.

“Dedicated as offerings of former shepherds were milk pails, side flutes, panpipes, and staffs”.

b 4.26.2

ἐνταῦθα ὁ Δάφνις συναθροίσας πάντα τὰ ποιμενικὰ κτήματα διένειμεν ἀναθήματα τοῖς θεοῖς· τῷ Διονύσῳ μὲν ἀνέθηκε τὴν πήραν καὶ τὸ δέριμα, τῷ Πανὶ τὴν σύριγγα καὶ τὸν πλάγιον αὐλόν, τὴν καλαύροπα ταῖς Νύμφαις καὶ τοὺς γαυλοὺς οὓς αὐτὸς ἐτεκτῆναιτο.

“Then Daphnis gathered together all of his pastoral possessions and dedicated them among the gods. To Dionysus he dedicated his knapsack and his goatskin, to Pan his syrinx and his side flute, to the Nymphs his staff and the milk pails that he had made himself”.

T. 10 Hld. *Aeth.* 5.14:

Καὶ ἦν ἡ γραφή, παιδαρίσκος ἐποίμαινε πρόβατα χαμαιζήλῳ μὲν πέτρᾳ πρὸς περιωπὴν ἐφεστὼς τὴν δὲ νομὴν τῇ ἀγέλῃ πλαγίοις αὐλήμασι διατάττων, τὰ δὲ ἐπέιθετο ὡς ἐδόκει καὶ ἡνείχετο πρὸς τὰ ἐνδόσιμα τῆς σύριγγος ποιμαίνόμενα.

“And this was the engraving: a little boy tended the cattle standing on a low rock around a place commanding a wide view on the grazing and herding the animals at the sound of the side flute. And it seemed that the herd was charmed and kept up with the key-tune of the syrinx”.

T. 11 Hesych. φ 1135 Cunn.:

⟨φῶτιγξ⟩· [αὐγή.] σύριγξ. λῶτινος αὐλός, [ὡς] εἶδος σάλπιγγος.⁵¹

⁵¹ Cfr. Hesych. φ 1135 Cunn. ⟨φῶτιγξ⟩· [αὐγή.] σύριγξ, †φλογιός† αὐλός, [ὡς] εἶδος σάλπιγγος. Apart from φλογιός, which has a dubious relation to musical sphere but pairs with αὐγή, the crucial point stays in the ὡς pertaining to εἶδος σάλπιγγος preserved in vg, two families of Cyril manuscript. ὡς *del.* Hase (vd. Hansen-Cunningham 2009, 192).

T. 12 *Lexica*

a EM 480.1:

λέγεται δὲ καὶ <ῥυγξ> σύριγξ μονοκάλαμος.

b Ps. Zonar. *Lex.* Φ 1838:

φωτίγγιον ὄρνενον.

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