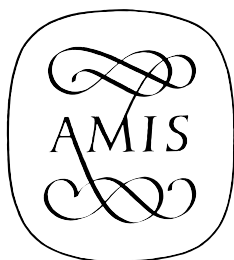


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Precursors of the Bassoon in France before Louis XIV*

James B. Kopp

It was in 1651 that the thirteen-year-old dauphin of France announced to his parliament, "*l'état, c'est moi*." With this bolt of absolutist aplomb, Louis XIV declared his majority and began a reign that would be marked by some of the most munificent and egocentric arts patronage in history. Through his patronage, a uniquely French style of music developed during the seventeenth century, a style based on dance and the *air de cour*.¹ "What had been Italian and mythological in the early French baroque . . . was changed by the king's fancy to a national art, becoming in another few decades international, the grandiose form of art and life of the civilized world."²

Even a uniquely royal style of woodwind instruments arose at the court of Louis XIV. Musicians in his service redesigned the shawms, flutes, and recorders of the Renaissance and early baroque eras into their late-baroque successors, according to a tradition traceable to the court flutist Michel de la Barre, writing circa 1740.³ The multi-jointed construction and revised bores of the reformed instruments have been duly noted by historians.⁴ But only recently has research emphasized another new characteristic, one of even more critical importance: a new pitch standard, approximately a minor third lower. Given the small leeway available for adjusting the pitch of woodwind instruments, the adoption of a new pitch standard was an epochal event. On the one hand, it

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1. Julie Anne Sadie, "Louis XIV," *The New Grove Dictionary of Music and Musicians*, 2nd ed. [henceforth *NGDMM*] (London: Macmillan, 2001), 15:219.

2. Paul Henry Lang, *Music in Western Civilization* (New York: Norton, 1941), 445.

3. The relevant portion of the letter is quoted and translated below, at note 36.

4. See, for example, Anthony Baines, *Woodwind Instruments and their History*, 3rd ed. (New York: Dover Publications, 1977), 275–78; Philip Bate, *The Flute: A Study of its History, Development and Construction*, 2nd ed. (New York: Norton, 1979), 80–84; Ardal Powell, "The Hotteterre Flute: Six Replicas in Search of a Myth," *Journal of the American Musicological Society* 49 (1996): 261.

enabled woodwinds to perform at the lower pitch with singers in ballets, operas, and the royal chapel, with important consequences for the sound and style of music in those institutions. But the new standard also meant that the older, royally sanctioned woodwinds were incompatible with the lower pitch and thus suddenly obsolete. Bruce Haynes identified a decisive period, 1664–70, when the changeover to the new instruments and lower pitch took place.⁵

Facing the glare of the Sun King's brilliant court, we must squint a little as we look beyond to note the accomplishments of his father's era. Experiments in woodwind instrument making were in fact under way at the court of Louis XIII, a skilled composer and dancer who reigned from 1610 until his death in 1643.⁶ His widow, Anne of Austria, was regent during her son's minority. Many of the instruments and performance practices of Louis XIII's musical establishment during the 1630s are documented in an encyclopedic survey of musical instruments by Marin Mersenne, published in Latin in his *Harmonicorum instrumentorum libri IV* and in French in his *Harmonie universelle*. The miscellany of bass double-reed woodwind instruments pictured and explained by Mersenne⁷ included the old bass shawm or *hautbois*, the *basse de hautbois de Poitou*, the *courtaut*, the *cervelat* (or rackets), and four proto-bassoons that have, as yet, resisted full understanding and categorization.⁸ Ironically, Mer-

5. Bruce Haynes, *The Eloquent Oboe* (Oxford: Oxford University Press, 2001), 56.

6. For a brief introduction to Louis XIII in relation to music history, see Julie Anne Sadie, "Louis XIII," *NGDMM* 15:217; David Buch, *Dance Music from the Ballets de Cour 1575–1651* (Stuyvesant, N.Y.: Pendragon Press, 1993), xviii.

7. Marin Mersenne, *Harmonicorum instrumentorum libri IV* (Paris, 1636), 83–91, and *Harmonie universelle* (Paris, 1636; facs. ed. François Lesure, Paris: Éditions du Centre National de la Recherche Scientifique, 1965), 3:295–307 (these treatises have complicated paginations; hereafter, arabic page numbers will be citations from the "Liber secundus de instrumentis pneumaticis" of the former and the "Livre cinquième des instruments à vent" of the latter); Mersenne, *Harmonie Universelle: The Books on Instruments*, transl. Roger E. Chapman (The Hague: Nijhoff, 1957), 368–82; Wolfgang Köhler, *Die Blasinstrumente aus der "Harmonie Universelle" des Marin Mersenne* (Celle: Moeck, 1987), 210–62. See appendix 1 for bibliographical comments on Mersenne's writings. Unless otherwise noted, all translations throughout this article are my own.

8. Mersenne's illustrations arose from two different sources, as Köhler described: "A clear difference in quality is noticeable among the illustrations of the *Harmonie universelle*. On the one hand are carefully executed copper-plate engravings, and on the other, less expertly prepared woodcuts, which Mersenne perhaps had produced in the convent or even by his own hand." Köhler, *Die Blasinstrumente*, 21–22. Köhler's reference is to Mersenne's letter to Nicolas-Claude Fabri de Peiresc, 25 May 1635,

senne's survey of the royal instrumentarium did not depict the conventional dulcian or curtal, which is more familiar to latter-day musicians than any of Louis XIII's bass woodwinds. In fact, the one-piece, two-key dulcian is only obliquely documented in Parisian musical life.

In recent years, the *basse de cromorne* has been recognized as yet another bass woodwind of the mid-seventeenth century. This term, because of a superficial similarity, was long misidentified with the crumhorn, a cylindrical windcap instrument with a distinctively upcurved bell. But the *basse de cromorne* is now understood to be a contrabass oboe in use shortly before mid-century. Haynes hypothesized that it served in double-reed ensembles until the baroque bassoon was developed.⁹

Bass woodwind types outnumbered higher-pitched types for understandable reasons. A woodwind large enough to sound the bass register was always relatively difficult to manufacture, carry, and finger, so makers produced a variety of ingenious solutions. Some of these—the *courtaut* and *cervelat*—made use of a cylindrical bore, which achieved a given pitch with only half the length of a conical bore. Interesting as these instruments are in their own right, they stand outside the history of the bassoon proper, and receive only passing mention in this article.

Among the conical bass woodwinds, particular instrumental types were used in certain musical ensembles, but not others. This article briefly surveys possible ancestors of the late-baroque bassoon as they were used in three different musical contexts in seventeenth-century France: choir schools, the king's *Hautbois et Musettes de Poitou*, and the king's *Douze Grands Hautbois*. The last of these was apparently home to the four proto-bassoons shown by Mersenne. Because these four instruments differed markedly from one another, and because their esoteric designs have elicited conflicting interpretations, the following discussion

reproduced in *Correspondance du P. Marin Mersenne, religieux minime V*, ed. Cornelis de Waard (Paris: Éditions du Centre National de la Recherche Scientifique, 1959), 212–13 (letter 436). According to de Waard, some plates of *Harmonicorum instrumentorum libri IV* (on pp. 46, 108, and 166) carry the signature “H. le Roy fecit.”

9. See Bruce Haynes, “New Light on Some Relatives of the Hautboy,” in *Sine Musica nulla vita: Festschrift Hermann Moeck*, ed. Nikolaus Delius (Celle: Moeck, 1997), 257–70. Haynes credited Vincent Robin, “Contrebasse de Hautbois, ou Cromorne? Éléments de recherche pour l'identification du cromorne français au XVIIe et XVIIIe siècles” (Mémoire de Diplôme de Musique ancienne, Conservatoire Supérieure de Paris, CNR, 1995) with a leading role in the reidentification of the *cromorne*.

spares few details.¹⁰ A guide to certain technical terms used will be found in appendix 2, while appendix 3 contains measurements and other details of the various bass woodwinds.

Dulcians in France

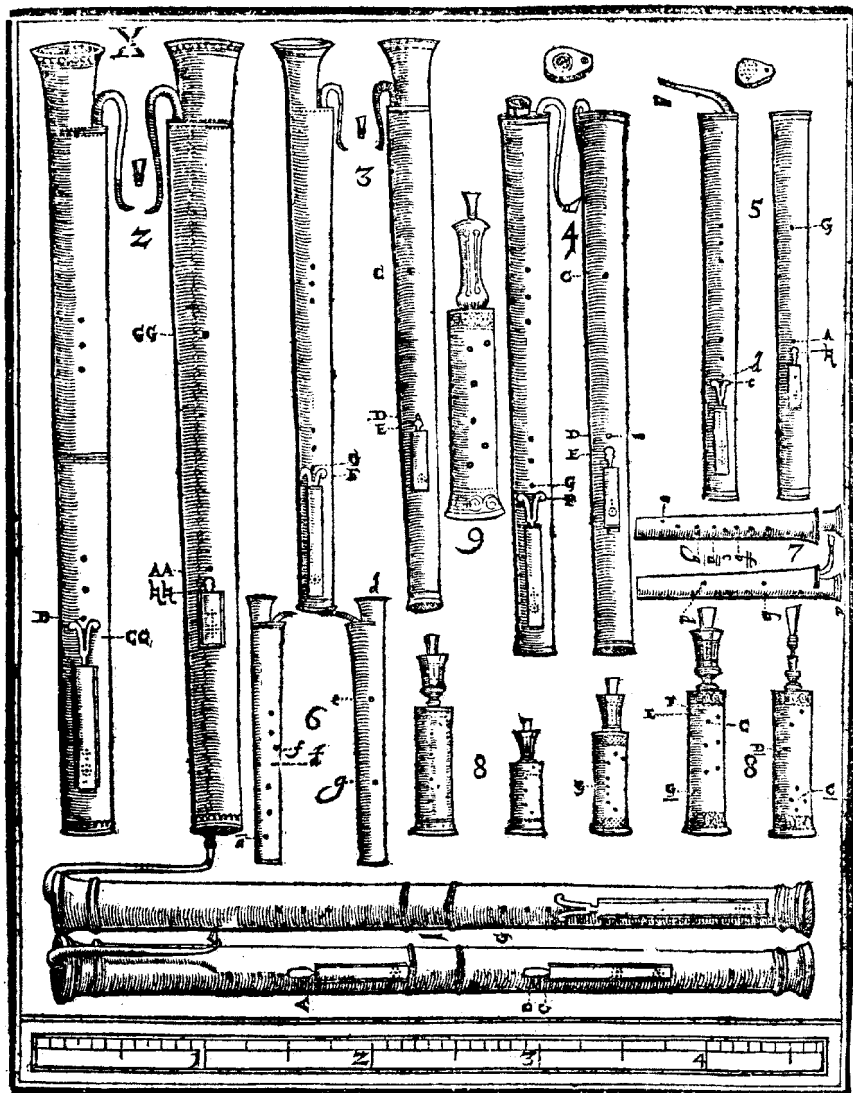
The dulcian was documented in Italy and Spain in the early sixteenth century and in England, Flanders, and German-speaking lands by the late sixteenth century. (See figure 1.) A principal use of the bass size in these countries was to reinforce men's voices in choir schools. This role was so stereotyped that the bass dulcian was called *fagotto-chorista* by Zacconi and *Chorist Fagott* by Praetorius.¹¹ Though little noticed, there are reports of a similar use in the provinces of France.¹² Henri-André Durand observed that the *basson* formed part of a "classic" musical establishment at Avignon's collegial chapter of Saint-Agricol during the early seventeenth century, together with cornett, serpent, choir, and organ. Durand, working with archival sources covering the period 1612–60, also noted that the *basson*, like the serpent, was used to double plainchant at the unison.¹³

10. Mersenne's description of these proto-bassoons has been interpreted in numerous writings, most notably the following: Lyndesay G. Langwill, *The Bassoon and Contrabassoon* (New York: Norton, 1965), 25–28; Käthe Wagner, "Die Fagott-Instrumente des 17. Jahrhunderts" (Diplomarbeit, Schola Cantorum Basiliensis, 1976), 15–17; Richard Semmens, "The Bassoons in Marin Mersenne's *Harmonie Universelle* (1636)," this Journal 10 (1984): 22–31; Alyson Elizabeth Roberts, "Studien zur Bauweise und zur Spieltechnik des Dulzian" (Ph.D. diss., University of Cologne, 1987), 9–24; James B. Kopp, "Notes on the Bassoon in Seventeenth-Century France," this Journal 17 (1991): 85–114; Graham Lyndon-Jones and Peter Harris, "Reconstructing Mersenne's *Basson* and *Fagot*," *Fellowship of Makers and Researchers of Historical Instruments Quarterly* 64 (1991): 9–20 (Communication 1048); Paul J. White, "The Bass Hautboy in the Seventeenth Century," in *A Time of Questioning: Proceedings of the International Early Double-Reed Symposium*, Utrecht, 1994, ed. David Lasocki (Utrecht: STIMU, 1997), 167–82; William Waterhouse, "Bassoon," *NGDMM* 2:880–81.

11. Lodovico Zacconi, *Prattica di musica* (Venice, 1592) and Michael Praetorius, *Syntagma musicum II: De organographia* (Wolfenbüttel, 1619); both quoted in Waterhouse, "Bassoon," 877 and 880.

12. Frank Dobbins, *Music in Renaissance Lyons* (Oxford: Clarendon Press, 1992), 82, translated *douçaines* as "curtalls." But it should be noted that specialists consider the mysterious *douçaine* to have been an instrument distinct from the dulcian. See, for example, Barra R. Boydell, "Dolzaina," *NGDMM* 7:436.

13. Henri-André Durand, "Les Instruments dans la musique sacrée au chapitre collegial Saint-Agricol d'Avignon," *Revue de musicologie* 52 (1966): 78.



1. Sordnen-Bas. auff dreyden Seiten. GG. 2. Doppel-Fagott bis ins GG. 3. Offen Chorist-Fagott C. 4. Gedact Chorist-Fagott, C. 5. Enger Keyholt. Balletter Tenor zum Chorist-Fagott. G. 6. Alt. d. 7. Discant oder Exilant zum Chor-Fagott. a. 8. Einmald Klavieren. 9. Grefß Klavert, so tieff als der gar Grosse Bass-Bombard, CC, Dff 16. Fuß, Tenon.

Figure 1. Dulcians and other instruments as illustrated in Michael Praetorius, *Syntagma musicum II: De organographia* (Wolfenbüttel, 1619; facs. ed. Wilibald Gurlitt, Kassel: Bärenreiter, 1958), plate X. Item 3 is a bass dulcian or *Chorist Fagott* with open bell. Item 4 is a bass dulcian with a *gedackt* or covered bell.

A similar use of the *basson* was reported at Rouen. Abbé A. Collette wrote: "In the seventeenth century, several instruments were introduced into the choir: the serpent and the *fagon* [sic] or *basson* for the accompaniment of plainchant, and the cornet, sackbut, and stringed instruments—violins, viols, and bass viols or violoncellos—to accompany [figural] music."¹⁴ J. A. Clerval implied that a similar usage was known at Chartres: "Beginning in the seventeenth century, the serpent or the *basson*, the contrabass and perhaps the violin were taught in the choir school, in addition to the organ. The first two were begun in 1655."¹⁵

The *New Grove Dictionary* explained the pitch at which German dulcians were built:

The *chorist-Fagott* or *deutsche Fagott* (i.e., the curtal) long continued its traditional role in providing discrete accompaniment to choirs, and traditional shawms were played well into the 18th century. These instruments were pitched at Praetorius's old high *CammerThon* at A+1 [a semitone above A-440].¹⁶

In France, a similar pitch was called *ton d'Écurie*. Even though no French dulcians are known to survive, we may be reasonably sure that they were pitched at the equivalent of *ton d'Écurie*, since they were interchangeable with the serpent.

Aside from these dulcians in choir schools, another French reference seems unlinked to any performance tradition. Pierre Trichet, writing at Bordeaux, ca. 1630–49, owned a *jeu de bassons à quatre parties*. He described *bassons* as multi-part instruments, "except for the *dessus*." He also noted that the *dessus* had only ten holes, in contrast to the larger sizes,

14. "Au xvii^e siècle, plusieurs instruments furent introduits dans le choeur: le serpent, le fagon [sic] ou basson pour l'accompagnement du plain-chant. Et le cornet, la sacquebutte et les instruments à cordes: violons, violes, et basses de violes ou violoncelles, pour accompagner la musique." Abbé A. Collette, *Histoire de la maîtrise de Rouen, Première partie: Depuis les origines jusqu'à la révolution* (Rouen, 1892; reprint Geneva: Minkoff, 1972), 71. A page later, Collette remarked: "En 1626, on acheta trois basses-violes pour les Enfants" ("In 1626, three bass viols were purchased for the children"; *ibid.*, 72, n. 1). James Anthony unfortunately arrived at a paraphrase so distant as to imply that the *basson* was employed in figural music, and that its purchase at Rouen could be dated to shortly after 1626. But Collette's words did not justify either implication. See Denise Launay, "À propos d'une messe de Charles d' Helffer," in *Le "Baroque musical," Colloques de Wegimont 4* (1957): 191; Anthony, *French Baroque Music*, revised and expanded ed. (Portland, Oregon: Amadeus Press, 1997), 20.

15. J. A. Clerval, *L'ancien Maître de Notre-Dame de Chartres* (Paris, 1899), 127.

16. Bruce Haynes, "Pitch: Western Pitch Standards," *NGDMM* 19:797.

which had twelve or thirteen holes.¹⁷ Thus Trichet's *dessus des bassons* answered the description of a conventional small dulcian, possibly in the descant range.

It is with the foregoing reports in mind that we must interpret a passage by Mersenne, who made an isolated reference to the *basson* in Proposition XXIV of *Harmonie universelle*, which dealt with the serpent.

Musicians have invented several instruments to be blended with voices in order to remedy the shortcomings of bass and *dessus* singers. Deep bass voices are very scarce, so the *basson*, the sackbutt, and the serpent are used, just as the cornett is used to reinforce the *dessus* singers, who are not usually good.¹⁸

Mersenne did not say whether these remarks applied to Louis's royal chapel or to any Parisian church. The church of Paris had a singular liturgy and an austere ritual, Durand reported: "Instruments other than the organ were excluded until the very end of the seventeenth century." According to *The New Grove Dictionary*, "French wind instruments . . . never played in church" during the 1630s. But by 1645, the royal chapel employed two cornettists.¹⁹

Mersenne's treatment of *bassons*, which is discussed below, is otherwise confined to chapters widely separated from this mention. Given the breadth of Mersenne's usage of the term *basson*, it is possible to believe that he referred here to the conventional dulcian, rather than any of the more singular instruments employed in the royal musical ensembles. In the early seventeenth century, the *basson* player in a religious service would very possibly have been a singer or priest. An association with dancing probably would have tainted players from the *Douze Grands*

17. François Lesure, "Le Traité des instruments de musique de Pierre Trichet," part 1, *Annales musicologiques* 3 (1955): 367; facs. ed. Philippe Lescat and Jean Saint-Arroman in *Basson: Méthodes et Traités, Dictionnaires* (Courlay: Editions J. M. Fuzeau, 1999), 11.

18. "Les musiciens ont inuenté plusieurs instrumens pour les mesler avec les voix, & pour suppleer le defect de celles qui font la Basse et le Dessus, car les Chantres qui ont des Basses assez creuses sont fort rares, c'est pourquoy l'on vse du Basson, de la Sacquebute & du Serpent, comme l'on se sert du Cornet pour suppleer celles du Dessus, qui ne sont pas bonnes pour l'ordinaire." Mersenne, *Harmonie universelle*, 278.

19. Durand, "Les instruments dans la musique sacrée," 73; Bruce Haynes, "Pitch: Western Pitch Standards," *NGDMM* 19:705; Guillaume du Peyrat, *Histoire ecclésiastique de la cour* (Paris, 1645), quoted in Anthony, *French Baroque Music*, 24.

Hautbois (who doubled on instruments of the violin family), barring their participation in the liturgy.²⁰

Marcelle Benoit dated the addition of *symphonistes* (instrumental musicians) to the royal chapel music to the 1660s or slightly earlier: "Lully contributed to the normalization of this usage, which dated from a little before his time; he encouraged the admission of instruments into scores intended for solemn ceremonies. . . ."²¹ The use of a bass woodwind in the royal chapel is first recorded in 1668, when Nicolas (ii) Hotteterre played *basson* there. The lower pitch used in the chapel at that time would have demanded a low-pitch instrument, probably a transitional or late-baroque bassoon, as discussed below.²²

The Basse de Hautbois de Poitou

Within the large musical establishment of Louis XIII was *La Grande Écurie du roi* (The King's Great Stable), the administrative seat and residence of the most accomplished wind players in France. One reason for this perhaps surprising posting of the wind players was the king's fondness for equestrian events with musical accompaniment.²³ In general, the function of the *Écurie* musicians was to orchestrate "the pomp and ceremony of court life: the royal births, marriages and funerals; the heralding of the king's arrival in towns and villages throughout the realm; and the welcoming of . . . foreign dignitaries."²⁴ In addition to state occasions, *les hautbois* (that is, the various shawms, *courtaut*, *cervelat*, and *basson*) were suitable "for large gatherings, such as dances, . . . weddings, village festivals, and other public celebrations," Mersenne wrote.²⁵

20. Marcelle Benoit, *Versailles et les musiciens du roi, 1661–1733: Étude institutionnelle et sociale* (Paris: Picard, 1971), 188–89.

21. *Ibid.*, 188.

22. Ernest Thoinan [Antoine Ernest Roquet], *Les Hotteterre et les Chedeville* (Paris: Sagot, 1899), 21; Jane M. Bowers, "Hotteterre: (4) Nicolas Hotteterre (i) [*l'ainé*]," *The New Grove Dictionary of Music and Musicians*, first ed. (London: Macmillan, 1980), 8:735. According to Catherine Massip, *La Vie des musiciens de Paris au temps de Mazarin (1643–1661)* (Paris: Picard, 1976), 26, the *états* of the chapel are lacking between 1638 and 1664. *L'État de la France*, in the words of Albert Cohen, was a "semi-official administrative handbook . . . issued periodically as a guide to the organization and operation of the French royal court." See Albert Cohen, "L'État de la France: One Hundred Years of Music at the French Court," *Notes* 48 (1991–92): 767–805.

23. Buch, *Dance Music from the Ballets de Cour*, xviii.

24. Anthony, *French Baroque Music*, 22.

25. "Quant à leur Musique, elle est propre pour les grandes assemblées, comme pour les Balets (encore que l'on se serue maintenant des Violons en leur place) pour

Despite the outdoor focus of much of this music, Haynes theorized that one division of the *Écurie*, the *Hautbois et musettes de Poitou*, may have functioned as a chamber group, given its small numbers. Mersenne showed and described the four instruments of the *Hautbois de Poitou* consort: the *cornemuse* (a mouth-blown bagpipe) and the three sizes of the *hautbois de Poitou*: *dessus*, *taille*, and *basse*. (See figure 2.) He explained that they played three-part music, and that the *cornemuse* doubled the *dessus* at the unison. A three-part chanson in score exemplified the quartet's orchestration.²⁶

The *dessus* of the *hautbois de Poitou* was identical with the detached chanter of the *cornemuse*. It could be played with the bag or with the windcap shown. The bass member of this family, obviously too large to serve as a bagpipe chanter, was thus a derivative design. Both the *taille* and *basse* sizes of this instrument may have been conceived at the royal court, with the intention of creating an ensemble capable of playing music in parts.

The *basse de hautbois de Poitou* was a two-billet torso with a detachable bell. Drawing on the definition of faggot (or fascine) as "a bunch of sticks," Paul J. White used the adjective "faggoted" to describe this binding together of two parallel cylinders.²⁷ Despite its outer appearance, the *basse de hautbois de Poitou* had a conical bore. (The conventional dulcian, often called *fagot* in early times, ironically lacks such an outer appearance.) Absent in Mersenne's illustration but possibly present on the instrument were a leather wrapping and/or metal ferrules, which may have served to bind the two tubes together. Mersenne said in French that

The bass is broken at C in order to be more portable, and to have all its holes disposed so that one can cover them with the fingers; this could not be done if its two branches were continued in a straight line. But one must note the details of these *hautbois*, and see how they are different from those I explained in the 30th Proposition [that is, the Italian musette]. The length of the bass is from its receiver A to its bell B. To sound it the reed and the crook I are inserted into the receiver A. But this reed is covered by the windcap D (shown separately in H), in such a way that the crook, the reed and the windcap, which one blows into at the end [marked] D, comprise the figure AED. The first hole, which vents the lowest sound, is closed by the flap G of the thumb key GF. The same thumb is used to close the second hole. The third hole is behind; that is why it is marked in white. It is not necessary to

les Nopces, pour les Festes des villages, & pour les autres resiouyssances publiques." Mersenne, *Harmonie universelle*, 303.

26. Haynes, *The Eloquent Oboe*, 53; Mersenne, *Harmonie universelle*, 307.

27. White, "The Bass Hautboy," 167–69.

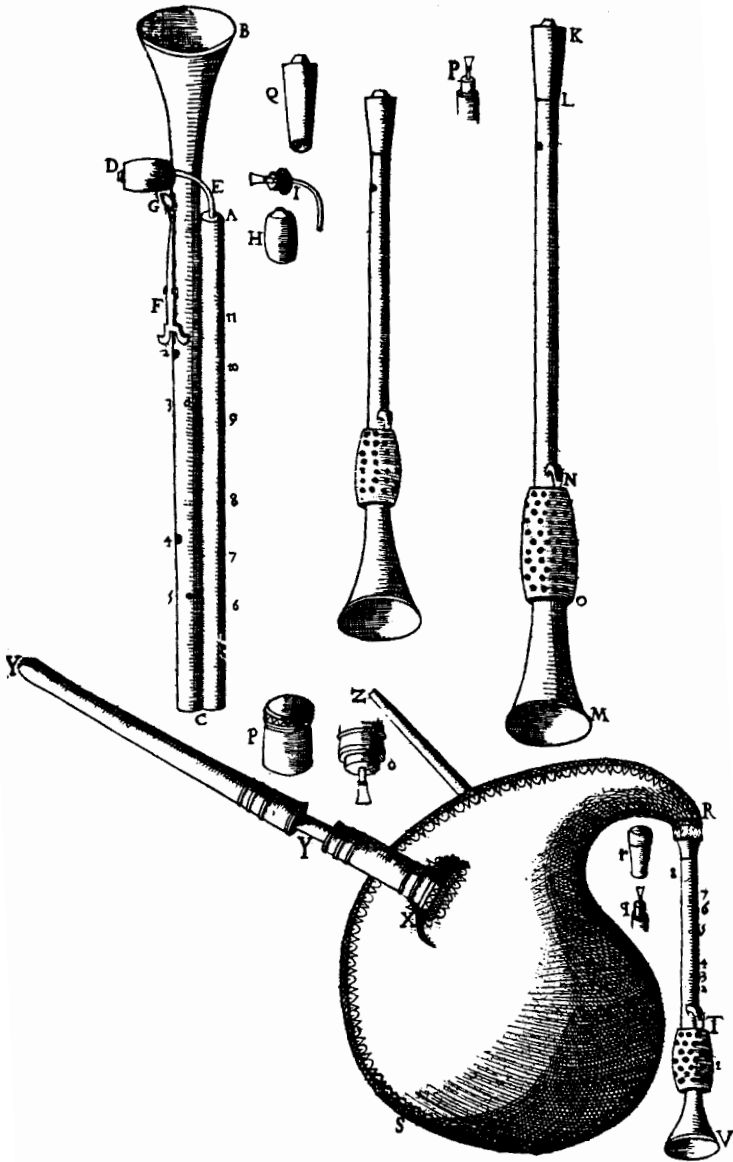


Figure 2. The *hautbois de Poitou* consort as illustrated in Marin Mersenne, *Harmonie universelle* (Paris, 1636), 306. At top left is a *basse de hautbois de Poitou*. When played with its windcap (shown in detail H), it was called *basse-contre de musette de Poitou*. Continuing clockwise, a *dessus de musette de Poitou*, a *taille de musette de Poitou*, and a *cornemuse*. Terms revised by the present author.

explain the other holes, because they are seen very easily, and there is no difficulty in closing them. . . .²⁸

No exemplar of the *basse de hautbois de Poitou* is known to survive, and Mersenne provided the sole illustration. In fact, *MGG* was skeptical of the existence of the illustrated instrument:

The peculiarities described are so unusual that doubt may be raised whether Mersenne was depicting an existing instrument. The locations of the tone holes in the rear tube allow for no conclusions about a proper sequence of half and whole tones; it may be true that this instrument, like Mersenne's *basson*, gives five tones below the six-finger pitch. Perhaps a vague oral report of a bass *hautbois de Poitou* led to a description of a phantom.²⁹

However, Mersenne's description was almost perfectly consistent with his naturalistic engraving and three-voice sample score. He generalized a bit too much when he wrote that "the range of each of these *hautbois* is similar to that of the *Grands Hautbois*";³⁰ presumably the added, eleventh tone hole of the bass would have yielded BB-flat, a major second lower than the C of the shawm.

The player's hands governed six finger holes on the down bore. In a unique feature, the palms of the player's hands governed holes VII and IX, located on opposite surfaces of the up bore. (This fingering system showed some parallels to that of the *courtaut*, including six finger holes on the down bore and two thumb holes on the up bore. The *courtaut's* holes VII and IX were governed, however, by the player's little fingers upon *tetines*, wooden tubes that connected to the up bore.) The lower

28. ". . . la Basse est brisée en C, afin d'estre plus portatiue, & d'auoir tous ses trous tellement disposez que l'on puisse les boucher des doigts; ce que l'on ne pourroit faire si ses deux branches estoient continuées en ligne droite. Mais il faut remarquer les particularitez de ces Haut-bois, & voir enquoy ils sont differents de ceux que i'ay expliquez dans la 30. Proposition. La longueur de la Basse est depuis son commencement A iusques à sa pate B: & pour en sonner l'on emboëtte l'anche, & le cuiuret I dans l'embouchure de la Basse A: mais on couure cette anche de la boëtte D que l'on voit separée en H, de sorte que le cuiuret, l'anche & la boëtte, que l'on embouche par le bout D, sont la figure AED. Le premier trou qui fait le son le plus graue est bouché par la palette G de la clef GF, laquelle on baisse du mesme doigt dont on bouche le second trou: le troisieme trou est derriere, c'est pourquoy il est marqué en blanc: il n'est pas necessaire d'expliquer les autres trous, puis qu'ils paroissent tres-bien, & qu'il n'y a nulle difficulté à les boucher." Mersenne, *Harmonie universelle*, 305–06.

29. Andreas Masel, "Doppelrohrblattinstrumente," *Die Musik in Geschichte und Gegenwart*, 2nd ed. [henceforth *MGG*], *Sachteil 2* (Kassel: Bärenreiter, 1994), col. 1372.

30. "Or l'estenduë de chacun de ces Haut-bois est semblable à celle des grands Haut-bois. . . ." Mersenne, *Harmonie universelle*, 307.

thumb governed hole VIII, and the upper thumb governed hole X and the key for hole XI. (See appendix 2 for an explanation of the Roman-numeral terminology used in this article for finger holes.)

Archival records indicate that the *basse de hautbois de Poitou* was in regular use in the *Hautbois et Musettes de Poitou* before and after Mersenne's writing. One member of the quartet played *dessus de hautbois de Poitou*. A second played either *cornemuse* or *taille de hautbois de Poitou*. A third played either *taille de hautbois de Poitou* or *basse-contre de musette de Poitou*, and a fourth played either *basse-contre de musette de Poitou* or *dessus de musette de Poitou*. These specified roles remained constant even as personnel in the ensemble changed over the years.³¹

This archival evidence allows us to recognize a more refined nomenclature than Mersenne himself used. Judging from the terminology of the players' posts, the *cornemuse* was the one bagpipe of the ensemble. The *musette de Poitou*, contrary to latter-day definitions, appears not to have been a bagpipe at all (unlike the *musette de cour*, which was a bellows-blown bagpipe). A distinction was drawn between the *dessus de hautbois de Poitou* and the *dessus de musette de Poitou*. Most likely, the former instrument, in which one player specialized, was the chanter played with the reed taken directly into the mouth.³² Given this direct contact with the reed, plus the thumb hole, the player of the *dessus de hautbois de Poitou* would have been able to obtain at least some overblown notes.

Following this reasoning, the *dessus de musette de Poitou* was the same chanter played with its windcap, and the *basse-contre de musette de Poitou* was

31. Massip, *La Vie des musiciens*, 158–60.

32. Mersenne said of the *cornemuse de Poitou*: "This *cornemuse* differs from the *chalumeau*, of which I spoke in the 25th Proposition [rightly 26th], only in that lacks a small drone. . . ." ("Cette Cornumuse n'est differente de la Chalemie, don't i'ay parlé dans la 25. Proposition, qu'en ce qu'elle n'a point de petit Bourdon. . . .") Mersenne, *Harmonie universelle*, 305.

Discussing the *chalumeau*, Mersenne had commented: "Now this *chalumeau* is played in two fashions, namely by blowing into the hole A [the lead-pipe], or by the reed δζ, when one removes the *chalumeau* from the bag and speaks, that is to say, moves the tongue as if one were speaking while blowing the air through the reed; as I have said at greater length in discussing the *musette*, this makes the sound of this instrument much more agreeable, more rousing, and more vigorous." ("Or l'on iouë de ce *Chalumeau* en deux façons, à sçavoir en soufflant simplement par le trou A, ou par l'anche δζ, lors que l'on tire le *Chalumeau* hors de la peau, & en parlant, c'est à dire en remuant la langue comme si l'on parloit en mesme temps que l'on pousse le vent en bouchant ladite anche, comme ie diray plus amplement au traité de la *Musette*: ce qui rend le son de cet instrument beaucoup plus agreeable, plus esueillé & plus vigoureux.") Mersenne, *Harmonie universelle*, 285.

the pictured bass instrument, played with its windcap. Given that windcaps tend to inhibit the production of overblown notes, we may speculate that overblowing was a lower priority for the various sizes of the *musette de Poitou*. The bass, moreover, lacked the thumb hole of the smaller sizes. It is noteworthy that Mersenne never referred to the *cornemuse* by any other name, even though he pictured and described the French *musette de cour* and the Italian *musette*.³³

Our interpretation suggests that the quartet had two orchestrations available, of which only the first was illustrated by Mersenne:

- I. Treble line = *cornemuse* + *dessus de hautbois de Poitou*
 Alto line = *taille de hautbois de Poitou*
 Bass line = *basse (contre) de musette de Poitou*
- II. Treble line = *dessus de musette de Poitou* + *dessus de hautbois de Poitou*
 Alto line = *taille de hautbois de Poitou*
 Bass line = *basse (contre) de musette de Poitou*

Between 1644 and 1648, three different members of the *Hautbois et Musettes de Poitou* ensemble were noted as players of the *basse-contre de musette de Poitou* or *basse-contre de muzette de Poitou*.³⁴ Thus these *basse-contre* players (François Bien, Jean Destouches, and Jean Brunet) used either Mersenne's *basse de hautbois de Poitou*, or some successor to it. A similar mention, dated 7 February 1625, marked the purchase by François de Bien of the post held by his predecessor (Zamet Bournault, known as Verdelet), as *joueur de taille de hautbois de Poitou et de basse de musette*.³⁵ Thus we may infer that some sort of *basse de musette de Poitou* existed by 1625, and some instrument of the same name was in use until 1648 or beyond. Michel de la Barre, writing circa 1740, seemed to imply that the *basse de hautbois de Poitou* was abandoned a few years after Lully became *surintendant* of the royal chamber music in 1661:

After this time, *musettes* were left to shepherds; violins, recorders, theorbos, and viols took their place, although the transverse flute came later. Philibert was the first to play this instrument in France, and Descouteaux only a little later. The king, who like all his court was infinitely pleased with this instrument, added two positions to the four *Hautbois et Musettes de Poitou*, giving them to Philibert and Descouteaux. They told me several times that the king said, when installing them, that he strongly desired that the six *musettes*

33. Mersenne, *Harmonie universelle*, 287–91, 293–94.

34. Massip, *La Vie des musiciens*, 158–60.

35. Madeleine Jurgens, *Documents du minutier central concernant l'histoire de la musique (1600–1650)*, vol. 1 (Paris: S.E.V.P.E.N., 1969), 242.

should be metamorphosed into transverse flutes; at least they would then be useful, in place of the *musettes*, which were only suitable to make peasants dance.³⁶

Archival evidence is compatible with the notion that the older *hautbois de Poitou*, *musette de Poitou*, and *cornemuse* passed out of use around this time. In 1661, Descouteaux had joined the *Hautbois et Musettes de Poitou* as *dessus de hautbois de Poitou*, raising its strength to five members. Jean Destouches and Jean Brunet were still listed as players of the *basse-contre de muzette de Poitou*, Brunet apparently sharing the post with his son, Jean Louis Brunet. Beginning in 1664 (date of the next surviving record), the old instruments were omitted from the listing of individual players' names. From this time, the group name survived, but no player's instrument was specified. In 1666, the quintet had become a sextet. Philibert was mentioned first in 1667, and by 1668 he seems to have replaced Jean Louis Brunet.³⁷

Basses of the Douze Grands Hautbois: The Shawm

Still other bass woodwinds, including the bass shawm, *courtaut*, *cerve-lat*, and four bassoon-like instruments, found their home in the *Douze Grands Hautbois*, another division of the king's *Grande Écurie*. In *Harmonie universelle*, Mersenne demonstrated the group's six-part orchestration through a sample score, assigning the top two lines to the *dessus de hautbois* (treble shawm), the third and fourth to the *taille de hautbois* (alto shawm), the fifth to the sackbutt, and the sixth to the *basse de hautbois* (bass shawm).³⁸

36. "Dès ce temps-là on laissa les musettes aux bergers; les violons, les flûtes douces, les theorbes, les violes prirent leurs place, car la flûte traversière n'est venue qu'après. C'est Philibert qui en a joué le premier en France, et puis presque dans le même temps Descouteaux. Le roi aussi bien que toute la cour à qui cet instrument plut infiniment, adjouta 2 charges aux 4 musettes du [sic] Poitou et les donna à Philibert et à Descouteaux; et ils m'ont dit plusieurs fois que le roi leur avait dit en les leur donnant qu'il souhaitait fort que les 6 musettes fussent métamorphosées en flûtes traversières, qu'au moins elles seraient utiles, au lieu que les musettes n'étaient propres qu'à faire danser les paysannes." The "Mémoire de M. de La Barre sur les musettes et hautbois," MS Paris, Archives Nationales O¹ 878, no. 240, is published in Jules-Armand-Joseph Écorcheville, "Quelques documents sur la musique de la Grande Écurie du roi," *Sammelbände der internationalen Musik-Gesellschaft* 2 (1900–01): 633–34, and also in Marcelle Benoit, *Musiques de cour: Chapelle, Chambre, Écurie, 1661–1733* (Paris: Picard, 1971), 455.

37. Benoit, *Musiques de cour*, 4, 13, 15, 17, 18, 22.

38. There is a discrepancy in the Latin, where Mersenne assigned the sixth or bass line to the sackbutt: "Bassus tuba tractili exprimendus." Mersenne, *Harmonicorum*

Mersenne pictured the bass shawm twice. The first illustration is flawed, as Köhler noted,³⁹ including a superfluous numeral 7. (See figure 3.) This meaningless numeral led Mersenne to count eleven tone holes rather than the correct ten. (Mersenne's second illustration was numbered correctly, however; see figure 4.) Like surviving instruments, his bass shawm had six finger holes, plus four more tone holes governed by keys. What Mersenne wrote about the finger holes of the *taille*, a smaller instrument, presumably applied to the bass as well:

It must be remarked that the holes of these instruments are drilled on the bias, so that they connect to different places inside. This I have shown by the white of the holes [of the *taille*]. For example, the white of the first hole shows that it is slanted toward the reed, and that of the second that it inclines toward the third, and thus all the others. This is done in all large instruments, so that the exterior holes are close enough to one another to be closed by the fingers, and [yet] the interior holes, when they meet the bore, are separated enough to make the [proper] intervals.⁴⁰

The six finger pitch was G, as Mersenne indicated, and the lowest pitch obtainable was C. Keys VII, VIII, and IX were protected by the *fontanelle*, a perforated wooden barrel, while key X was concealed under a smaller brass casing, which Mersenne called *poche*. Only the second of Mersenne's illustrations showed a tuning hole between X and the bell opening. The receiver, Mersenne wrote,

is higher than the [player's] mouth can reach. Thus the brass crook AB is used, at the end of which one affixes a reed at point A for the mouth. This crook descends as low as necessary for the ease of the player.⁴¹

instrumentorum libri IV, 89. This probably arose from confusion with *basse taille*, Mersenne's alternate term in *Harmonie universelle* for the fifth voice: "seconde taille, ou basse taille pour la Sacquebout." Mersenne, *Harmonie universelle*, 304.

39. Köhler, *Die Blasinstrumente*, 355, note 464.

40. "... mais il faut remarquer que les trous de ces instrumens sont faits en biais, afin qu'ils respondent à vn autre lieu du dedans, qu'à celuy du dehors; ce que i'ay signifié par le blanc des trous: par exemple le blanc du premier trou de la Taille montre qu'il biaize vers l'anche, & celuy de second qu'il s'auance vers le troisieme, & ainsi des autres. Ce que l'on pratique dans tous les grands instrumens, afin que les trous extérieurs soient assez proches les vns des autres pour pouuoir estre bouchez par les doigts, & que les internes qui se rencontrent dans la concauité, soient assez esloignez pour faire les interualles des tons." Mersenne, *Harmonie universelle*, 296.

41. "... elle est si longue, que la bouche ne peut atteindre iusques au haut, c'est pourquoy l'on vse d'vn canal de cuiuure AB, au bout duquel on attache vne anche au point A pour l'emboucher: or ce cuiuret descend aussi bas comme il est necessaire pour la commodité de celuy qui sonne de cette partie. ..." Mersenne, *Harmonie universelle*, 297.

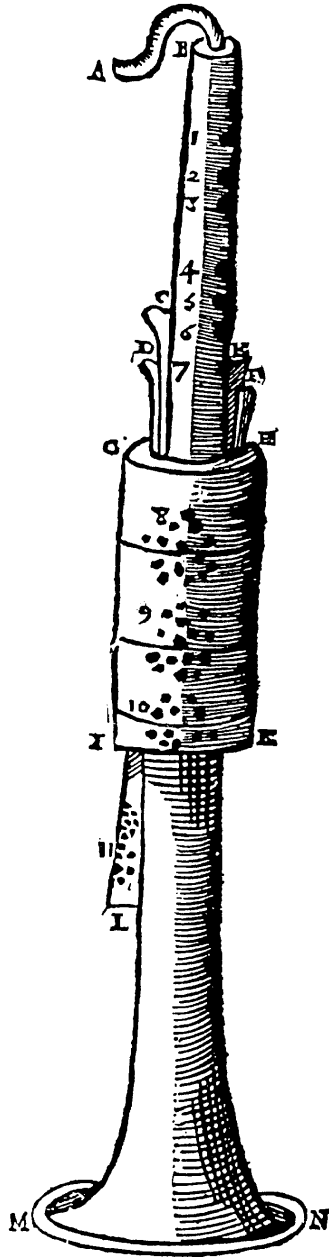


Figure 3. *Basse de grand hautbois*, or bass shawm, as illustrated in Marin Mersenne, *Harmonie universelle* (Paris, 1636), 297.

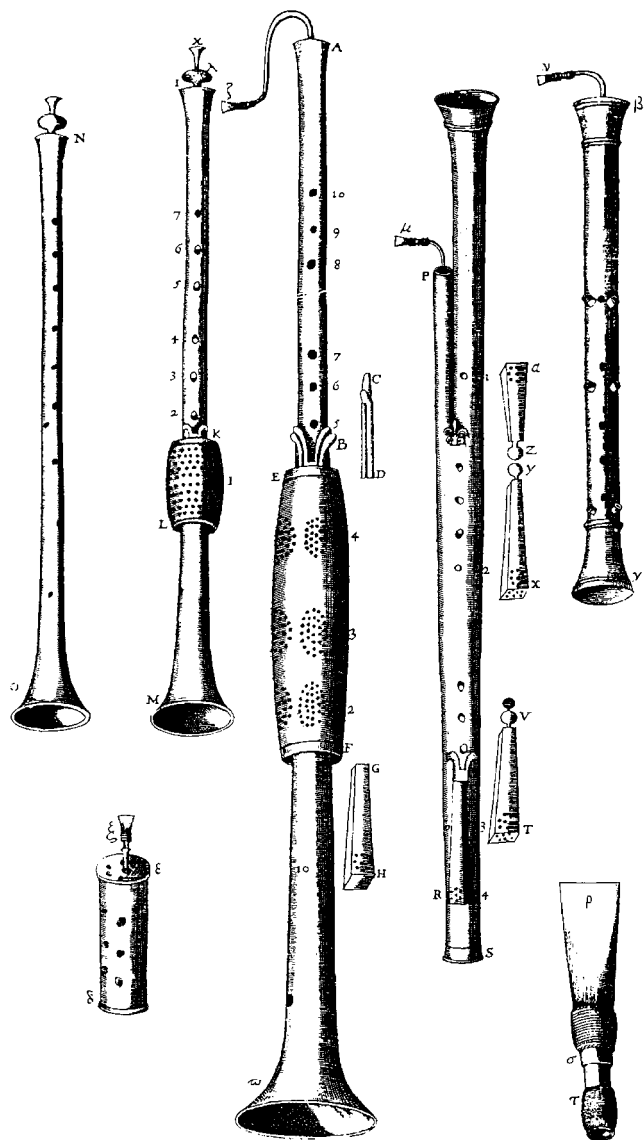


Figure 4. *Les hautbois* as illustrated in Marin Mersenne, *Harmonie universelle* (Paris, 1636), 302. The top row includes, from left, a *dessus de grand hautbois* or treble shawm; a *taille de grand hautbois* or alto shawm; a *basse de grand hautbois* or bass shawm; a *fagot* or *basson*, a proto-bassoon referred to as M4 in this study; and a *courtaut*. At lower left is a *cervelat* or rackett. At lower right is an enlarged view of a reed intended for one of the *hautbois*.

The reed was taken directly into the player's mouth. Mersenne described the range of the shawms:

As to the range of the shawms, each part, for example the *dessus*, can play a fifteenth, for after one has played as many notes as there are holes, one begins anew with other tones, which are more forced and shrill, the wind being increased, as I have said in explaining other instruments with the same characteristic.⁴²

This would imply an even greater range for the bass with extension keys, although Baines considered the overblown notes of the bass to be less useful.⁴³

Proto-Bassoon M1

While numerous bass shawms identical to those shown by Mersenne survive in various European collections, the four proto-bassoons he illustrated and described are unlike one another and unlike any surviving instrument. Mersenne called the four bassoon-like instruments *fagot*, or *basson*, or both, leading some readers of *Harmonie universelle* to infer narrow distinctions. But in the seldom-cited *Harmonicorum instrumentorum libri IV*, Mersenne explicitly defined *fagot* as *fistula compacta*, and *basson* as *barytonum*.⁴⁴ Thus the first term denoted a folded-bore instrument, and the second a low-register instrument. Any attempt to maintain a narrower distinction will soon run afoul of Mersenne's broad and overlapping usage of the terms.

The following conventions of nomenclature will make discussion unambiguous in this study. The two instruments that appear, flanking the *courtaut*, on page 86 of *Harmonicorum instrumentorum libri IV* and page 298 of *Harmonie universelle*, are called M1 (left) and M2 (right). (See figure 5.) The instrument that appears in company with the *cervelat* on page 87 of *Harmonicorum instrumentorum libri IV* and page 300 of *Harmonie universelle* is called M3. (See figure 6.) The instrument shown among the

42. "Quant à l'estenduë des Haut-bois, chaque partie, par exemple le Dessus, fait la Quinziesme; car apres que l'on a fait autant de tons naturels qu'il y a de trous, l'on en recommence encore d'autres, qui sont plus forcez & plus aigus, en redoublant le vent, comme i'ay dit en expliquant les autres instrumens qui ont cette mesme proprieté." Mersenne, *Harmonie universelle*, 297.

43. Baines, *Woodwind Instruments*, 269.

44. Proposition IV, "Nomina sequentium Instrumentorum, & partium, quibus constant, proponere, & explicare," consists primarily of a table of French organological terms and their Latin equivalents. Mersenne, *Harmonicorum instrumentorum libri IV*, 79.

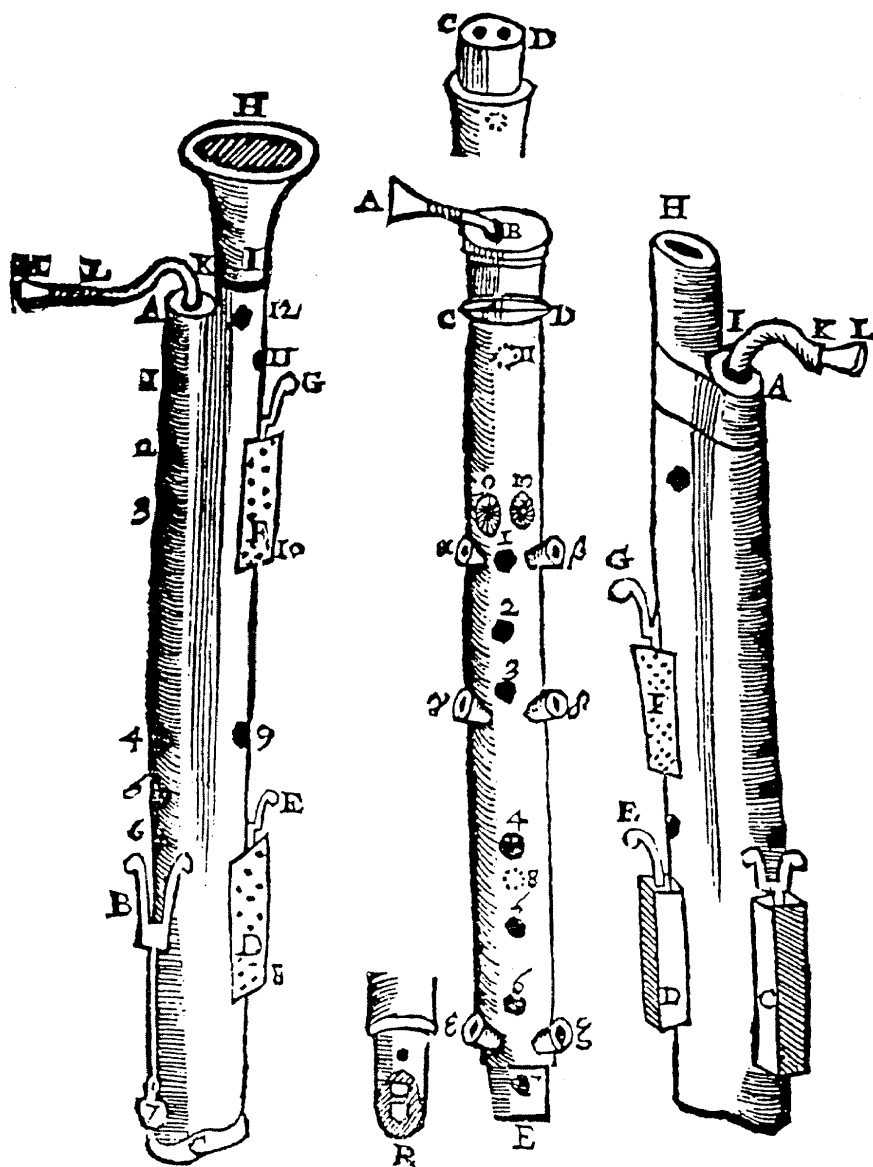


Figure 5. Two proto-bassoons and a courtaut as illustrated in Marin Mersenne, *Harmonie universelle* (Paris, 1636), 298. From left are the *fagot* or proto-bassoon referred to in this study as M1; a detail of the butt of M1; a *courtaut*, surmounted by a detail (rotated 90 degrees) of its twin bores; and the *fagot* or *basson* or proto-bassoon referred to in this study as M2.

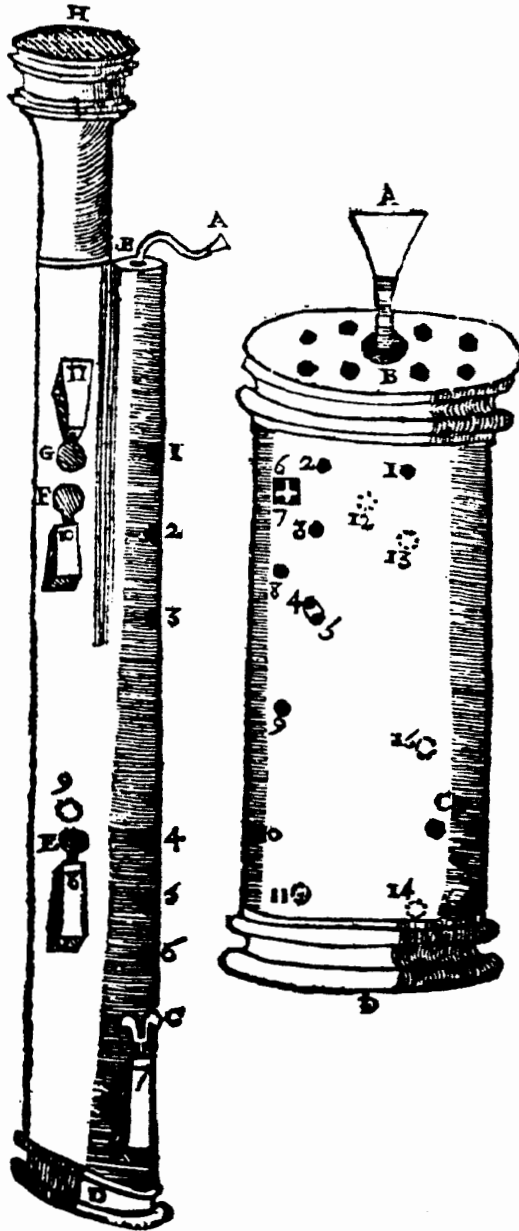


Figure 6. *Basson* or *tarot* or proto-bassoon (left) and *cervelat* as illustrated in Marin Mersenne, *Harmonie universelle* (Paris, 1636), 300. In this study, this proto-bassoon is referred to as M3.

family of *hautbois* on page 88 of *Harmonicorum instrumentorum libri IV* and page 302 of *Harmonie universelle* is called M4. (See figure 4.)

In 1965 Lyndesay G. Langwill articulated the traditional genealogy of the dulcian, the Mersenne instruments, and the jointed (that is, late-baroque) bassoon during the seventeenth century:

It is not possible to state precisely when in the seventeenth century the one-piece two-keyed dulzian gave place to the jointed three-keyed bassoon. The change entailed separation of the long-joint and tenor-joint, connected through the U-shaped butt-joint, and the addition of a bell-joint prolonging the bore to enable the production of B \flat which remains to this day the lowest note of the bassoon. As already mentioned Praetorius (1619) did not know the jointed bassoon and though Mersenne (1636) shows several types and vaguely refers to the tubes of one being 'fagotées ou liées', all appear to be of dulzian formation.

Richard Semmens echoed this view, noting that "the instruments under Mersenne's scrutiny had already entered a period of transition between the older dulzian and the more modern baroque bassoon."⁴⁵

But in a paper presented in 1994, Paul J. White disputed the "basic assumption of a direct linear development from the bass shawm to the dulcian and finally to the four-piece bassoon." Instead, he found it "just as likely that sectioned double-reed instruments preceded and then coexisted with the dulcian." He continued:

Rather than a step in the evolution towards a sectioned instrument, the dulcian seems more likely to have been a design improvement on an earlier sectioned bass instrument, bringing to it a combination of solid body and obliquely drilled tone holes.

To make this theory clearer, let us imagine the task faced by the instrument maker who, towards the end of the sixteenth century, first cut a bass shawm in half, folded it over, and joined the two bores together. Obviously these two bores needed to be secured together, either the brass banding or a leather wrap available at that time serving this function.⁴⁶

This was a bold departure from traditional thinking about the Mersenne instruments, but ultimately a fruitful insight. In light of White's theory, Mersenne's description of the structure of M1 and M2 in *Harmonie universelle* was no longer puzzling:

45. Langwill, *The Bassoon and Contrabassoon*, 28; Semmens, "The Bassoons," 22–23. Except for White, "The Bass Hautboy," and Waterhouse, "Bassoon," all the writings cited in note 10 embrace the traditional understanding of the bassoon's genealogy.

46. White, "The Bass Hautboy," 168–69.

C is the band of brass or other material that joins and surrounds the two branches of this instrument when it is not made of a single piece of wood.

In *Harmonicorum instrumentorum libri IV*, Mersenne likewise made reference to a two-piece instrument:

Note however that these instruments are sometimes made from two separate tubes, but other times from a single piece of wood. When made from two pieces, as in the instrument we are describing, the ends of the two bores are bound together by the copper band or iron girdle C, and the result of this is that one continuous bore is produced from the two.⁴⁷

White noted a “sagging line” contour at the bottom of M1 and M2, suggesting “two separately turned joints bound together with leather.”⁴⁸ For an approximate illustration of the structure White described, the reader may compare the structure of the *basse de hautbois de Poitou*.

Despite differences of fingering and embouchure, M1 resembled the *basse de hautbois de Poitou* in being faggoted, or constructed of two separate billets. (It differed from both the conventional dulcian and the *basse de hautbois de Poitou* in that hole VII connected to its down bore.) M1 was presumably bound in leather, as White noted. In fact, the detailed illustration of the “end R,” shown in figure 5, seems to peel away part of the leather so that “hole 7” can be seen better. In French, Mersenne described this as follows:

Now these two holes, which are in these two parts of the *fagot*, are closed with two plugs, so that the wind cannot escape from them, and so that the two bores of these two parts of the *fagot* are connected in such a way that the air which enters by the reed M does not leave until it reaches the twelfth hole and the bell opening H, when the eleven holes are closed. What I want to say about these two plugs will be easily understood by reference to the end R, which I have shown separately. The hole at the top is the seventh of the *fagot*, although it [also] serves to represent the end E of the *courtaut* BE, which I shall explain later.

Mersenne’s Latin text left no doubt that “the end R” was indeed the butt of M1:

47. “C montre la bande de cuiure, ou d’autre matiere, qui ioint & enuironne les deux branches de cet instrument, si ce n’est qu’on le fasse d’un mesme morceau de bois.” Mersenne, *Harmonie universelle*, 298–99. “Notandum est autem has tibias aliquando fieri ex duabus tibiis separatis, aliquando ex vnico frusto ligni; cum fit ex duobus, uti contingit in ea tibia quam describimus, extrema binorum caurum limbo aeneo C, vel ferrea fasciâ ita simul stringuntur, ut vnicum cauum continuum ex duobus conficiatur.” Mersenne, *Harmonicorum instrumentorum libri IV*, 85.

48. White, “The Bass Hautboy,” 169.

When made from two pieces, as in the instrument we are describing, the ends of the two bores are bound together by the copper band or iron girdle C, and the result of this is that one continuous bore is produced from the two. This is easily gathered from the separately shown piece R, in the end of which two white spots signify two wooden pegs, by which the cavity of the two tubes is thus stopped up so that air blown in at A [the receiver] or at M [the reed] cannot escape until hole 12, and thus arrives at the bell H, unless some one of the eleven aforementioned holes, for example 7, which the black dot on piece H [rightly R] reproduces, is opened.⁴⁹

Buried in this dry description of “piece R” is a far-reaching implication. “Hole 7,” shown atop “piece R,” led directly into the down bore (rather than obliquely), from the parabolic (not the elliptical) surface of R. In other words, tone hole VII (its key is not shown in the detail) was drilled parallel to M1’s transverse link.

White, who did not acknowledge that the “black dot” or “hole on the top” of detail R was identical with hole 7 of M1, believed that the transverse drilling itself was being illustrated.

The bottom of the two bores needed to be closed off and joined together. A simple solution was to drill a perpendicular hole from one side of the instrument through the first bore into the other, then place a cork to stop the entry hole. . . . We can see this side-drilled hole clearly illustrated among his group of fagots (see Plate 2A [which shows the detail of R]).⁵⁰

That the transverse link and hole 7 were concentric is theoretically possible. But see appendix 3 below for an argument that the transverse link lay 1.25 inches below hole 7.

The configuration Mersenne documents may startle readers familiar with the conventional dulcian and bassoon. The tone holes of the down

49. “Or les deux trous, qui sont en ces deux parties du Fagot, se bouchent avec deux chevilles, afin que le vent n’en puisse sortir, & que les deux canaux des deux branches du Fagot soient tellement continuez que le vent qui entre par l’anche M, ne sorte que par le douziesme trou, & par l’ouverture H, quand les vnze trous sont bouchés. L’on entendra fort aisément ce que ie viens de dire de ces deux chevilles par le bout R, que j’ay mis séparément, dont le trou qui est au dessus, est le septiesme du Fagot, quoy qu’il serue pour représenter le bout E du Courtaut BE, que j’expliqueray apres.” Mersenne, *Harmonie universelle*, 299. “Cùm fit ex duobus, vti contingit in ea tibia quam describimus, extrema binorum cauorum limbo aeneo C, vel ferreâ fasciâ ita simul stringuntur, vt vnicum cauum continuum ex duobus conficiatur: quod facile colligitur ex frusto R seorsim posito, in cuius extremo duae maculae albae significant duos clauos ligneos, quibus caua duarum tibiaram ita obturantur, vt aër inspiratus per A, vel per M non possit egredi donec ad 12 foramen, & ad H peruenerit, nisi aliquod ex 11 praedictis foraminibus, verbi gratia 7, quod nigro puncto frustum H refert, aperiatur.” Mersenne, *Harmonicorum instrumentorum libri IV*, 85.

50. White, “The Bass Hautboy,” 169.

bore of M1 faced away from the up bore; their surface openings were perpendicular to the tone hole openings of a conventional dulcian or bassoon design. In other words, M1 was played with its bores held front and back, rather than in the left-and-right configuration familiar to all players of dulcian or bassoon, in early or modern times. This front-and-back design of M1 challenges the modern reader's imagination, as no known dulcians or bassoons depart from the side-by-side configuration. Perhaps the most familiar analog is the saxophone, which has, in its larger sizes, a front-and-back configuration of bores. The airflow pattern is reversed, however: whereas the saxophone's down bore is held closer to the player's torso, M1's up bore was held closer.

If the illustrator of detail R had wished to show hole VII entering the elliptical surface, in the style of a conventional dulcian, he could easily have done so; instead, he made clear that VII enters the parabolic surface. The *basse de hautbois de Poitou*, engraved by a different illustrator, appears to share the front-and-back configuration of M1, M2, and M3, notwithstanding its unique fingering system. The palms of the hands, which are required to cover holes VII and IX, cannot reach these holes on the up bore unless the *basse de hautbois de Poitou* has a front-and-back configuration.⁵¹

A faithful reading of Mersenne's remarks allows a new understanding of his drawings of M1 and M2. Many critics of the drawings have given limited credence, if any, to Mersenne's woodcuts; "rough and disproportionate" and "incredibly crude" are among the reactions inspired.⁵² Lacking a key to Mersenne's surprising message, many readers have assumed that Mersenne intentionally offered a cubist perspective of more-or-less conventional, dulcian-like instruments, in an effort to show all the instrument's tone holes in a single image. But in fact, his perspective is almost photographically literal with respect to the circumferential placement of details, with the following exceptions: (1) holes IX and XI of M1 are rotated slightly for ease of viewing (although the nearby key touches for VIII and X are shown in full, diametric opposition to holes I through VI), (2) hole IX of M2 and the *poche* (key cover) for VIII are likewise ro-

51. Köhler, *Die Blasinstrumente*, plates 3 and 6, shows photographs of Köhler's own reconstruction of the *basse de hautbois de Poitou*, with bores to be held front and back. But his proportional redrawings of M1 and M3 appear ambivalent as to the bore configurations of those instruments. *Ibid.*, 360, 365.

52. Semmens, "The Bassoons," 24; Praetorius, *Syntagma musicum II: De Organographia Parts I and II*, transl. and ed. David Z. Crookes (Oxford: Clarendon Press, 1986), xvii.

tated slightly for ease of viewing (although the key touches for VIII and X are not), and (3) the crooks of M1, M2, M3, and M4 are rotated away from their playing positions, presumably for graphic simplicity. (The crook of *the basse de hautbois de Poitou* is shown in correct playing position, however.) It is true that lengthwise proportions in the woodcuts are often compressed and that interesting details tend to be magnified. But the woodcuts contain useful information about this dimension as well.

White's insight about the shawm derivation of M1 was a critical contribution to the historical understanding of the instruments shown by Mersenne. But he made other claims, recently echoed in *The New Grove Dictionary*, that are not sustained by existing evidence: that M1 was a bass-size instrument, and that the faggoted shawm design gave rise to the conventional dulcian.⁵³ Whereas White believed that the bass shawm (lowest note C) was the parent of M1, a close analysis of Mersenne's measurements, given in appendix 3, makes clear that M1 was significantly smaller than a folded bass shawm. Nor did M1 have all the characteristic proportions of a true shawm. Instead, it was significantly shorter above hole I and significantly longer below hole XI, its lowest tone hole. (White's suggestion that the conventional dulcian sprang from a faggoted shawm is discussed below.)

Proto-Bassoon M2

There was no Latin discussion of M2. In the French text, Mersenne likened it to M1, except for the lack of a bell and a twelfth hole:

The third figure on the right represents yet another *fagot* or *basson* with three keys, and with eleven holes. This one has no bell to cover the end H, which resembles the tenon hidden under the bell IH [of M1]. There is no need to explain the keys G, E, B nor the holes they close, namely F, D, C, nor the crook IK with its reed L, because all that has already been said in the explanation of the other *fagot* [M1].⁵⁴

53. White, "The Bass Hautboy," 168–69; Waterhouse, "Bassoon," 880–81.

54. "La troisieme figure qui est à main droite represente encore vn autre Fagot, ou Basson à trois clefs, & à vnze trous, mais il n'a point de pate pour couvrir le bout H, qui monstre quant & quant la figure du bout caché souz le paviillon IH. Il n'est pas besoin d'expliquer les clefs G, E, B, ny le lieu des trous qu'elles bouchent, à sçavoir F, D, C, ny le Cuiuret IK avec son anche L, puis que tout cela a desia esté dit dans l'explication de l'autre Fagot." Mersenne, *Harmonie universelle*, 299.

The relatively great height of “the end H” of M2 suggests that it was a self-sufficient bell in the style of many dulcians, rather than a tenon for a missing shawm-like bell in the style of M1. If Mersenne’s circumferential perspective is correct, then hole XI lay on the instrument’s right side, rather than the thumb or back side. This depiction, similar to that of M1’s hole 12, suggests that M2’s hole XI was an uncontrolled tuning vent, rather than a thumb hole. If this interpretation is correct, then M2 lacked the bass extension of M1, M3, and M4; its range would remain analogous to that of a shawm.

M2, like M1, was a two-billet instrument. This was made clear in the “corollary” to Proposition XXXIII, which explained the *phagotum*, a bellows-blown woodwind instrument with twin bores first described by Canon Afranio.

[O]ne can say that the term has been taken from our French expression *fagot*, because it contains two or more billets bound or faggoted together, as is seen in the two preceding [instruments M1 and M2], which I have explained and illustrated.⁵⁵

Proto-Bassoon M3

Mersenne’s Latin made clear what was vague in the French: M3 was a *tarot*, a lower-pitched instrument. (Mersenne also called M3 a *basson*, but the latter term was elastic enough to embrace M2, the *courtaut*, and the rackett.)

There remain two figures, namely BDH and BD, to be explained, of which the left of these is sometimes called *tarot*, but is generally called *basson*, because it is devoted to lower tones. It has eleven tone holes, of which four are closed by keys, the upper thumb governing two of these, F and G [X and XI]. The same finger governs holes 8 and 9 [VIII and IX], the former by means of key E. Finally, the right little finger operates key C [VII]. This woodwind, however, consists of a single piece of wood, like the following, called *cervelat* or sausage by its shape. . . .

In the French text:

55. “. . . l’on peut dire qu’elle a esté prise de nostre diction Françoisse *Fagot*, parce qu’il contient deux, ou plusieurs Flustes liées, ou fagotées ensemble, comme l’on void dans les deux precedens, dont i’ay expliqué & donné la figure.” Mersenne, *Harmonie universelle*, 305.

It is still necessary to explain other forms that serve as bass in all types of consorts, namely the *basson* BDH, which is on the left, and the *cervelat* BD. As for the basson, which is all of one piece of wood, it is easy to understand its construction and its parts by what I have said concerning the preceding *fagots*. It is only necessary to add that this one has four keys, because it descends lower. The same thumb that opens the key G [XI], likewise opens the key F [X], and the one that opens the ninth hole [IX], which is behind the instrument, also opens the eighth [VIII] by means of the key E. The first key C [VII] is opened with the little finger of the right hand.⁵⁶

During the discussion of M2, Mersenne remarked that

It is only necessary to add that *bassons* and *fagots* are not all the same size; some descend a third or fourth lower. Some call this type of instrument the *tarot*. It matters little what they are called, as long as one understands their structure and usage, which is to serve as bass in consorts of *musettes* and voices, and to play all sorts of music, according to its range, which is a tenth or eleventh.⁵⁷

The French text makes it clear that M3 was also a front-and-back instrument. Hole 8 was “behind” the instrument, approximately 180 degrees opposite holes I through VII.⁵⁸ Thus the front and rear tone holes

56. “Supersunt duae figurae, nempe BDH, et BD explicandae, quarum laeva praecedentibus similis vocatur a quibusdam tarot, vulgo tamen basson, quod sonis grauioribus inseruiat. Habet autem 11 harmonica formina, ex quibus quatuor totidem clauibus occultantur, itaut idem digitus duo, videlicet F & G aperiat, quod sit etiam in 8, & 9 foraminibus, quae ab eodem digito aperiuntur; sed 8 clave E occluditur. Denique clavem C aperit auricularis dexter. Haec autem tibia constat unico frusto ligni, quem ad modum sequens, quam Galli cervelat appellat a figura. . . .” Mersenne, *Harmonicorum instrumentorum libri IV*, 86. “Il faut encore expliquer d’autres figures qui seruent aussi de Basse dans toutes sortes de Concerts, à sçavoir le *Basson* BDH, qui est à gauche, & le *Cervelat* BD. Quant au Basson qui est tout d’une piece de bois, il est aysé d’entendre sa construction & ses parties par ce que nous auons dit des Fagots precedents. Il faut seulement adiouter que celuy-cy a quatre clefs, parce qu’il descend plus bas, & que le mesme pouce qui ouure la clef G, ouure semblablement la clef F, & que celuy qui ouure le neufiesme trou, lequel est derriere l’instrument, ouure aussi le huitiesme par le moyen de la clef E: quant à la premiere clef C, elle s’ouure avec le petit doigt de la main droite.” Mersenne, *Harmonie universelle*, 300.

57. “Il faut seulement adiouter que les Bassons, & les Fagots ne sont pas tous d’une mesme grandeur, & qu’il y en a qui descendent plus bas que les autres d’une Tierce, ou d’une Quarte. Quelques-vns nomment cette espece d’instrument *Tarot*, mais il import fort peu comme on les appelle, pourueu que l’on en sçache la fabrique & l’usage, qui consiste à servir de Basse aux Concerts des Musettes & des voix, & à chanter toute sorte de Musique, suiuvant son estenduë, que est d’une Dixiesme ou d’une Vnziesme.” Mersenne, *Harmonie universelle*, 299.

58. “. . . du septiesme au huitiesme, qui est derriere. . . .” Mersenne, *Harmonie universelle*, 301.

lay on the two parabolic surfaces of M3's oval column, in agreement with Mersenne's text. Mersenne's open circles, including hole 9 of M3, consistently designated holes on the hidden side of an instrument. He also blackened the key touches E, F, and G, again using negative coloration to depict keys sited on the hidden side of the instrument. Once again, hole 7 [VII] led to the down bore, above and parallel to the transverse cavity linking the two bores.

But M3 was made of a single piece of wood, as Mersenne said in both French and Latin (ignoring the detachable bell). While White was silent on M3 and its construction, *The New Grove Dictionary* misleadingly claimed that "none of the instruments illustrated [by Mersenne] show one-piece construction."⁵⁹ Knowing that M3 was a one-piece instrument, we may note a more fanciful conception than that of the foregoing instruments. The functional appearances of M1 and M2 openly revealed their faggoted structure, except where the leather bindings of M1 and M2 obscured the bottom third of the faggoting. But in the one-billet M3, a purely decorative simulation of such faggoting graced the upper half (or nearly so) of the instrument's right side. The significance of this is discussed below.

Features aside from the one-piece construction distinguished M3 from M1 and M2. As Mersenne noted, M3 included a fourth key for hole XI "because it descends lower." (The greater lengths between holes on this larger instrument took hole XI beyond the reach of the player's unassisted thumb.) The touches of keys VIII, X, and XI were round, unlike the traditional forked "fish-tail" of touch VII. Round touches are common on the thumb keys of surviving dulcians and shawms. (Mersenne confirmed that key VII was operated by the right hand, as in modern woodwind practice.⁶⁰ The symmetrical "tails" of VII would allow either hand to be used with equal ease, however.) The bell of M3 lacked the shawm-like exponential flare of M1's bell, instead flaring modestly to an opening decorated with a pair of turned beads. A circumferential line adjacent to the bocal receiver suggests that the bell was removable. The one ferrule of M3 was rolled at its top and bottom edges, adding rigidity as well as a decorative echo of the bell.

59. Waterhouse, "Bassoon," 880.

60. "... as to C, the first key, it is opened with the little finger of the right hand" ("... quant à la première clef C, elle s'ouvre avec le petit doigt de la main droite"). Mersenne, *Harmonie universelle*, 300.

Proto-Bassoon M4

Mersenne's fourth instrument represented yet another type of construction, in which the maker opted for the side-by-side configuration typical of all surviving dulcians and bassoons. The draftsmanlike engraving was closely representational, Mersenne noted, because it was intended as a pattern for makers of the various instruments:

I want to show all these instruments in a single plate, since they belong to the same consort, so that it [the plate] serves the spirit and hand of those who might wish to make similar instruments. A ω shows the bass in its true proportion. . . .⁶¹

The maker of M4 abandoned the front-and-back configuration of M1, M2, and M3 in favor of a design approaching that of the traditional dulcian. In doing so, he located the transverse cavity, linking down bore and up bore, at a lower position in the bore.

Four important features distinguished M4 from a conventional dulcian, however. One was the extended range afforded by the added tone-hole XI and its key. Second was the long expanse between receiver and hole I, complemented by an unusually short crook. This would have necessitated that the player hold M4 (or M1, M2, or M3, for that matter) close and parallel to his body. Mersenne's correspondent Trichet in fact prescribed such a playing position:

Bassons are held in a different way than shawms, which are held directly in front of the mouth, like the trumpet. But to play the *basson*, the bell must be pointed upward, in a perpendicular line, and the other end must be pointed toward the player's feet. Holding the instrument thus, fairly close to the chest and thighs, it is comfortably put to use.⁶²

This design contrasted with the somewhat longer crook shown in period illustrations of dulcians, the small end of which was bent more than

61. "Je veux faire voir tous ces instrumens dans vne mesme planche, puis qu'ils appartient à vn mesme Concert, afin qu'elle serue à l'esprit & à la main de ceux qui voudront faire de semblables instrumens. A ω monstre la Basse en sa iuste proportion. . . ." Mersenne, *Harmonie universelle*, 303.

62. ". . . pour entonner les bassons, desquels on se sert d'autre façon que des haubois, car on tient les haubois avancés hors la bouche comme on fait la trompette. Mais en sonnans des bassons il faut que le pavillon se trouve vers le haut en ligne perpendiculaire et que l'autre bout soit renversé vers les pieds du joueur. Et par ce moyen en tenant l'instrument assés proche de la poitrine et des cuisses on s'en sert commodément." Lesure, "Le Traité des instruments," 367; text corrected according to the facsimile in Lescat and Saint-Arroman, eds., *Basson: Méthodes et Traités, Dictionnaires*, 11.

ninety degrees away from the vertical. The bend and length allowed the dulcian player to tilt the bell away from his face, and to support the instrument's weight more comfortably on the fingertips. But the playing position of M4 was not altogether different from that of the bass shawm, where a longer crook brought the receiver close to the player's forehead.

A third difference was the path of hole VII. As drawn, the *poche* or key cover appears to be sited directly over the down bore, to which VII apparently leads. The locations of holes VI and VIII also suggest that a mid-point between them would occur here, not in the up bore.

The fourth significant difference between M4 and a conventional dulcian was the decorative recess in the body between the receiver and hole I. Again, a functionless cleft served as a memorial to the faggoted appearance of M1 and M2. M4 was marked with a fleur-de-lis just below this cleft, confirming its use by royal musicians. In the whole of *Harmoniorum instrumentorum libri IV* and *Harmonie universelle*, only the trumpet and the *musette de cour* shared this symbolism.⁶³

Discussion and Analysis

In this survey of bass woodwinds, two instrumental types are familiar to readers from their long-standing use in other countries. The conventional dulcian was found in choir schools throughout much of Europe, its classic role being to double men's voices in plainchant. The conventional bass shawm, also in broad international use, normally provided the lowest voice in the king's *Douze Grands Hautbois*.

But the other basses under discussion here—the *basse de hautbois de Poitou* and the four proto-bassoons—survive only in Mersenne's testimony. They provide clear evidence of a restless double-reed culture at the court of Louis XIII. From Mersenne's grand synopsis we know that multiple solutions to the unique design challenges of a bass woodwind instrument were being tested. Our new interpretation of Mersenne's prose and illustrations allows us to resurrect and reexamine design issues that were current in the *Écurie*.

Unlike the bass shawm, all the other bass woodwinds illustrated by Mersenne have folded bores. To the modern mind, this folding immediately raises thoughts of the dulcian, which had existed in other lands for a century before Mersenne's writing. It was also documented in choir

63. Illustrated in Mersenne, *Harmonie universelle*, 267–68, 290–91.

schools at Avignon, Chartres, and Rouen by the mid-seventeenth century; and Trichet documented a smaller size of dulcian at Bordeaux, apparently before Mersenne's writing. But aside from an apparent passing mention during discussion of the serpent, the conventional dulcian was absent from Mersenne's survey, and thus, we assume, from the instrumentarium of the *Écurie*. To attempt an explanation of this irony, we must examine the strengths and shortcomings of both the bass shawm and the folded-bore basses documented by Mersenne.

The advantages to the player of a folded instrument, as opposed to a shawm, included the improved mobility, accessibility, and tuning that resulted from incorporating both thumbs into fingering technique. Trichet confirmed that the shawm consort could sometimes be ill tuned and ponderous:

He who would make a consort of *hautbois* must be adept and practiced enough in composing that he knows how to mingle consonances with dissonances, as suspensions or passing graces. For by this means, if there is some harshness among the *hautbois*, it will be corrected, and the chords made much sweeter and more agreeable to the ear, just as vinegar serves as a seasoning to good foods, making them more flavorful. One must also arrange that the music be serious [*grave*] and that it have a slow tempo, unlike violins, which need to follow the stag's gallop rather than the tortoise's step. Thus the *hautbois* are reserved for [slower] dances and ballets, where they will only be graceful if the movements are not brusque and the steps are not nimble.⁶⁴

The new layout of finger holes and keys on folded-bore instruments offered some response to these complaints. Tones could be shaded flatter by partial covering of the primary vent (tone hole) with the appropriate thumb or finger, a useful method of tempering or fine-tuning sharp pitches. Whereas the shawm player controlled six unkeyed holes with the fingers, the player of Mersenne's folded-bore instruments controlled

64. "Il faut que celui qui veut faire un concert d'haubois soit tellement duit et versé à la composition des accords qu'il sache mesler bien à propos les consonances avec les dissonances en sincopant celles-ci ou les faisant passer en fredon. Car, par ce moyen, s'il y a quelque rudesse aux haubois elle se corrige et fait trouver les accords beaucoup plus doux et plus agréables à l'ouïe, tout de mesme qu'aux bonnes viandes le vinaigre sert d'assaisonnement pour les rendre plus savoureuses. On doit aussi faire en sorte que la musique soit grave et qu'elle tienne une mesure lente, au contraire des violons qui ont plus de besoing de suivre le galop du cerf que d'imiter les pas de la tortue. Aussi sont-ils réservés pour les danses et pour les bals, ou ils n'auroint gueres bonne grace si les mouvements n'estoient brusques et si les actions n'estoient pratiquées avec agilité." Lesure, "Le Traité des instruments," 351.

seven or eight. This offered an incremental increase in the player's control of intonation, especially in the lowest register. Mersenne noted that the *basse de hautbois de Poitou* was folded to be more portable, but also "to have all its holes disposed so that one can cover them with the fingers." This seems to draw a contrast with the shawm, where holes covered by four keys produced the lowest four tones. Praetorius also referred to this technique when discussing two sizes of great-bass dulcian (with bell-tones FF and GG, respectively): "It is very convenient if both sizes are available to the performer, since the semitones can be better pitched with fingers, rather than keys, over the holes."⁶⁵

A trill between VIII and VII became feasible on the folded instruments. The shawm player's lower little finger controlled these notes with a pair of keys, but the player of Mersenne's proto-bassoons used the little finger for VII alone. The thumb, a nimbler digit in itself, had a key (VIII) and an open hole (IX) to govern, an improvement in mobility over the two keys it governed on the shawm (IX and X). The upper thumb, idle on the shawm, governed the key X and (on M1) the open hole XI. With digital duties thus redistributed, low-register passages of increased range, complexity, and velocity became possible.

In addition to these advantages to the player, the folded-bore, three-billet design offered several advantages to the maker. First was the reduced length of the boring and reaming tools, a significant aid to control and accuracy. Yet this advantage was sometimes marginal, as shawms were themselves often made in two or three pieces: among surviving shawms, compare the bass dated 1600 and preserved at Nuremberg (MI 97), or the tenor and bass preserved at Berlin (nos. 1496 and 642, respectively).⁶⁶

Second, the maker of a one-piece shawm required a long billet massive enough to encompass the broad bell, so that much wood and time would be consumed during turning of the slender body. If the bell was

65. Praetorius, *Syntagma musicum II*, transl. and ed. Crookes, 48. "... sehr bequem ist / wenn man in der *Music* beyderley dieser arten haben kan: denn die *Semitonia* können in den Löchern durch die Schlüssel nicht also füglich / als durch die Finger geendert und zu wege bracht werden." *Syntagma musicum II: De organographia* (Wolfenbüttel, 1619; facs. ed. Wilibald Gurlitt, Kassel: Bärenreiter, 1958), 38.

66. See Martin Kirnbauer, ed., *Verzeichnis der Europäischen Musikinstrumente im Germanischen Nationalmuseum Nürnberg, Bd. 2, Flöten- und Rohrblattinstrumente bis 1750: Beschreibender Katalog* (Wilhelmshaven: Florian Noetzel Verlag, 1993), 115; Curt Sachs, *Sammlung alter Musikinstrumente bei der staatlichen Hochschule für Musik zu Berlin, Beschreibender Katalog* (Berlin: Verlag von Julius Bard, 1922), col. 272.

dismountable, as on M1, M3, and the *basse de hautbois de Poitou*, then only the short billet for the bell required this breadth. Meanwhile, the remaining billets could be very close to the finished size of the instrument, so that time was saved and little wood was wasted.

The multi-billet design was also less risky than the traditional dulcian design, which consisted of two side-by-side bores in a single billet. Even if the dulcian maker successfully drilled parallel starter holes, a danger remained that the reaming process, through which the bore was made conical, would pierce the thin wall (the web or septum) intended to separate them. Finally, the process of shaping the dulcian's exterior, if carried too far, could accidentally expose the bore to the dulcian's outer surface. In contrast, the makers of M1 and M2 were unconcerned with coordinating two bores within a single billet.

The design of M1 and M2 owed little to the conventional dulcian. In fact, they might well be called anti-dulcians, given their front-and-rear configurations, their connections of hole VII to the down bore, their short crooks, and their forked touch pieces for the thumbs. In addition, M1 had an extended lower range and a widely flaring bell. If we make the inevitable assumption that Parisian makers had been exposed to the conventional dulcian design, then each of these features represented a conscious rejection of dulcian-based solutions to design problems.

But neither was a shawm simply bisected to create Mersenne's proto-bassoons, except in the most conceptual and schematic sense. Instead, M1 was a freshly conceived instrument, borrowing selected characteristics from the shawm and from the *basse de hautbois de Poitou*. The crook as well as the orientation of tone holes on the down bore (I through VII) resembled the top half of a basset shawm (pitched a fifth higher than the bass shawm). The tone hole locations were roughly analogous to those of the shawm, with the exception of I, which was much higher on M1 than on the shawm. Holes VIII through X were again analogous to those on a bisected and folded shawm, although IX and X were rotated so that they appeared on the dorsal surface of M1's up bore.

Mersenne's first two instruments had a basic body design analogous to that of the *basse de hautbois de Poitou*. While it is impossible to ascertain priority for one design or the other, some observations may be made. The simple faggoting of the *basse de hautbois de Poitou* must have been a relatively fragile design, even if we assume that a leather binding and/or metal ferrules were stripped away for simpler illustration in Mersenne's engraving. If we focus on the "sagging line" contour White noted in the

full-instrument illustration, it would seem that M1 and M2 had a structural connection similar to the *hautbois de Poitou*. But if instead we focus on Mersenne's close-up of "piece R," which showed a smooth, oval shape for the butt of M1, we might reason to a different conclusion: that the maker of M1 and M2 planed the bottom quarters (approximately) of their billets on one surface each, in order to allow more secure joinery. This would account for their incompletely faggoted appearance in Mersenne's illustration (the recess between the two cylinders does not extend full length), and would suggest that they were later, improved analogs of the *basse de hautbois de Poitou*.

M3 appears to be a slightly later design than M1 and M2, a rethinking of the faggoted shawm within limits imposed by the decision to retain a front-and-back bore configuration. The one-piece construction invited the risks associated with dulcian production; we must ask what benefit was purchased at this considerable price. Possibly the transverse connection between the tubular billets of M1 and M2 (and the *basse de hautbois de Poitou*) proved to be fragile and thus prone to leaks. Presumably the technology was similar to that of mounting a *tetine* in a *courtaut*: a wooden tube was fixed with wax or glue into a duct opened through parallel bores.⁶⁷

Also of interest is the cleft on the right side of M3, apparently added for decorative reasons. (Presumably a left-side cleft was also present for symmetry, although we cannot be sure.) This suggests a strong desire to invoke the faggoted appearance of M1 and M2. Finally, the decision to govern XI with a key allowed it to be moved higher on the up-bore of the bass-sized M3, so that it lay in a more desirable acoustical position.

The illustrations of M1, M2, and M3 do not imply that the finger holes of these proto-bassoons were drilled radially or obliquely; that level of detail is absent. But since Mersenne commented that oblique tone holes were found even on smaller shawms, we may reasonably assume that these large, shawm-based instruments shared this feature.

M4 was apparently a still more advanced design than M3. If M3 represented an arguable flirtation with the one-piece dulcian design, M4 showed a further accommodation. The transverse link, which in M1, M2, and M3 was bored parallel to hole VII, was now a conventional dulcian-

67. ". . . on fait de petits morceaux de bois, qui se nomment *Tetines*, & qui sont entez sur le corps du Courtaut, pour aller rencontrer le second canal des trous de derriere." Mersenne, *Harmonie universelle*, 299–300.

type transverse, even though hole VII connected to the down bore, in the established French style.

Three benefits would have resulted from the resited finger holes of M4, which are rotated ninety degrees counter-clockwise on M4, as compared with the other Mersenne instruments. First was the player's angle of addressing M4. The player of M1, M2, or M3 would have had the up bore very close to his face, even if he rotated the instrument slightly so that the crook could pass the bell en route to the player's mouth. Given the apparent shortness of the illustrated crooks, this might have been uncomfortable, and thus a contributing reason for the resiting of holes on M4.

Second, the greater mass of wood in the single billet of M4 would have allowed for deeper chimneys, as obliquely bored tone holes are often called. This technological advantage would have brought the holes more conveniently under the player's hand spans, and simultaneously closer to acoustically correct positions. Third, the player's grip on the left-and-right M4 would have been slightly less stretched and therefore more comfortable.

Like the maker of M3, the maker of M4 fashioned a decorative recess in the instrument's surface, throwing receiver and bell into relief and thus evoking the faggoted design of M1 and M2. Although a minor benefit in handling would ensue from reducing the instrument's weight, the stronger implication of the decorative clefts of M3 and M4 is that their makers were at pains to preserve a vestigial link with the shawm.

M4 was possibly made from a single billet of wood. Three bits of evidence support this supposition. First is its continuous appearance in Mersenne's illustration. Second, a highly oblique boring of holes I through VI, as seen in the engraving, demands a thick wall, which was most amply present in a one-piece body. Third, the illustration shows hole X centered on the dorsal surface; if M4 were truly a faggoted instrument, this would be impossible. Without explanation, White wrote that "the *basson* [M4] was sectioned." *The New Grove Dictionary* also implied it was a sectioned instrument.⁶⁸ However, neither author acknowledged the one-piece construction of M3, which Mersenne clearly described. But as Mersenne himself wrote, "these instruments are sometimes made from two separate tubes, but other times from a single piece of wood." (Here Mersenne was presumably ignoring the question of a detachable

68. White, "The Bass Hautboy," 171; Waterhouse, "Bassoon," 880.

bell; the bell of M3, for example, required a second billet. There is no evidence that M4 had a detachable bell.) We can offer arguments about whether M4 was a one-piece or sectional instrument, but we will perhaps never be certain.

Compared to a conventional dulcian, both the receiver and the bell portion of M4 were longer, requiring the drilling of very long bores. If M4 was in fact a one-piece instrument, this would be an ironic affront to the maker's concerns discussed above. But the technology was not out of reach: several one-piece great-bass dulcians survive, with side-by-side bores longer than those of M4.⁶⁹

Sizes of Mersenne's Proto-Bassoons

Among Mersenne's proto-bassoons, the size of M3 was the best documented. (See tables 1 and 2.) Mersenne clearly described M3 as a *tarot*, "producing lower tones" than the preceding instruments. He also gave complete measurements that correspond roughly to those of some surviving bass shawms, except that a lower tone hole was added, yielding an eleven-finger note of BB-flat.⁷⁰

M4 was apparently also a *tarot*, descending to BB-flat. Like M3, it had a fourth key governing hole XI, implying a large expanse between X and XI. All the individual instruments in Mersenne's engraving of the *haut-bois* consort shared an approximately equal hand span, implying that the visual scale (except for the magnified reed) was roughly constant.

Mersenne's measurements for M1 were incomplete and otherwise problematic. He gave no measurements for the interval X to XI, and only an unacceptably small measurement for VI to VII. Furthermore, his measurements for XI to the end of the tenon under the bell and for the bell itself were surprisingly large. At a little less than nine inches in length, the bell of M1 was even longer than that of the bass-sized M3, which measured eight inches. None of the three other proto-bassoons shared this striking proportion.

69. See Graham Lyndon-Jones, "Four Great Curtals," *Fellowship of Makers and Researchers of Historical Instruments Quarterly* 81 (1995): 44–51 (Communication 1395).

70. See tables 1, 2, and 3 and appendix 3 below for a tabulation and interpretation of Mersenne's measurements, which are given in *Harmonie universelle*, 298, 300–01; and *Harmonicorum instrumentorum libri IV*, 85–86.

Table 1. Two proto-bassoons measured by Marin Mersenne, in French inches (= 27.07 mm) and lines (= $\frac{1}{12}$ inch)

Segment	M1 (verbatim)	M1 (edited)	M3 (verbatim)	M3 (edited)
Crook	—	—	—	—
Receiver-I	4.00	4.00	9.50	9.50
I-II	1.25	1.25	1.50	1.50
II-III	1.25	1.25	1.50	1.50
III-IV	4.50*	4.50	8.00	8.00
IV-V	1.25	1.25	1.50	1.50
V-VI	1.25	1.25	1.50	1.50
VI-VII	1.33	7.50	7.00	7.00
VII-VIII	5.00		4.00	
VII-transverse		1.25		2.00
Transverse-butt		.50		.50
Butt-transverse		.50		.50
Transverse-VIII		5.00		4.00
VIII-IX	6.25	6.25	7.00	7.00
IX-X	2.33	2.33	5.50	5.50
X-XI	—	4.67	10.00	10.00
XI-bell			6.00	6.00
XI-XII	7.50	1.33		
XII-tenon end	5.50			
XII-bell		3.50		
Bell	<9.00	9.00	8.00	8.00
Down billet	—	22.75	33.00	33.00
Up billet	—	32.58	41.00	41.00
Overall	—	55.33	74.00	74.00
Diameter (\emptyset) of Bell	—	4.00	3.00	
\emptyset of Bell tenon	1.25		—	
\emptyset of Receiver	6 lines		—	
\emptyset of I through VI	3 lines		—	
\emptyset of XII	6 lines		—	

*Mersenne, *Harmonicorum instrumentorum libri IV*, 85, gives 3.5 inches. Mersenne, *Harmonie universelle*, 298, gives 4.5 inches.

Table 2. Comparison of measurements of proto-bassoon M3 with a bass shawm* (1 French inch = 27.07 mm)

Segment	M3 (inches)	M3 (mm)	shawm (mm)
Receiver-I	9.50	257.2	266
I-II	1.50	40.6	47.5
II-III	1.50	40.6	42.5
III-IV	8.00	216.6	193
IV-V	1.50	40.6	48
V-VI	1.50	40.6	45
VI-VII	7.00	189.5	274
VII-VIII	6.00†	162.4	171
VIII-IX	7.00	189.5	97
IX-X	5.50	148.9	254
X-bell	24.00	649.7	404
Overall	73.00‡	1976.1	1843
Diameter of Bell	3.00§	81.2	170#

*The instrument chosen for comparison, no. 97 in the collection of the Germanisches Nationalmuseum in Nuremberg, is signed "MH," and was possibly made in Augsburg and used in Nuremberg. It is pictured and described in Martin Kirnbauer, ed., *Verzeichnis der Europäischen Musikinstrumenten im Germanischen Nationalmuseum Nürnberg, Band 2: Flöten- und Rohrblattinstrumente bis 1750: Beschreibender Katalog* (Wilhelmshaven: Florian Noetzel Verlag, 1993), 115-18. (No surviving bass shawms of French manufacture are known.)

†Mersenne's measurement here was 4 inches. See appendix 2 and table 1 for an explanation of my editing.

‡Mersenne's total measurement was 74 inches, identical to the sum of his measurements as edited here. To make the total comparable to the shawm's overall length, I have subtracted one inch of non-sounding length (one-half inch, transverse to butt, on each billet).

§Mersenne did not make clear whether this was an inner or outer diameter.

#This is an outer diameter.

Still, we may easily gather that M1 was a significantly smaller instrument than the bass-sized M3. As table 3 shows, the down-bore measurements of M1 were generally a little smaller than those of at least two surviving basset shawms, while the up bore measurements were somewhat larger. The overall length of M1 was approximately 8% greater, partly because of the added tone hole XI. Why the maker of M1 created such an instrument in the basset range is not difficult to fathom. While weighing less than the bass shawm, it would apparently have reached as low as F, adequate for many bass lines. A basset M1 might also have addressed a difficulty by taking the *seconde taille* line, second from the bottom in the six-voice texture of the *Douze Grands Hautbois*. Problems of intonation, noted by both Praetorius and Trichet, arose in consorts employing numerous sizes of the same instrument, each pitched a fifth above or below its neighbor.⁷¹

The *taille de hautbois* and the bass shawm, for example, had six-finger pitches of a and G respectively, while the *dessus* had a six-finger pitch of e'.⁷² If the basset shawm had been added to the ensemble, its six-finger pitch would have been d. This may be why the sackbutt (which Praetorius called "the wind instrument *par excellence* in concerted music of any kind," because of its chromatic flexibility) was employed on the *seconde taille* line. Mersenne did not explain the sackbutt's presence in this consort of shawms, but the two families of instruments had been grouped together within the *Écurie* as early as 1529.⁷³ Possibly M1 was an experimental instrument intended as an in-tune shawm for the *seconde taille* line. If

71. Praetorius, *Syntagma musicum II*, transl. and ed. Crookes, 47–48; Praetorius, *Syntagma musicum II*, facs. ed. Gurlitt, 37.

72. Mersenne's range for the *premier taille* part, which descends to f, calls for explanation. His fingering for g was "all closed," corresponding to the standard alto size described by Praetorius. Mersenne also observed that "the name *taille* indicates that this instrument sounds about a fifth deeper than the *dessus*." The composition was already "transposed for the shawm consort," as Mersenne said (*Harmonie universelle*, 304), so the answer did not lie in a further transposition.

The other possibility was the use of a lower-pitch instrument, which Praetorius advocated. Mersenne's *taille de hautbois de Poitou* was possibly an f instrument, for he gave the fingering for g as "all closed without the key." Yet Mersenne also said of the *Hautbois et Musettes de Poitou* consort, "the range of each of these *hautbois* is similar to that of the *grandes hautbois*," leaving his readers to grapple with the contradiction. See Mersenne, *Harmonie universelle*, 307; Praetorius, *Syntagma musicum II*, facs. ed. Gurlitt, 57; transl. and ed. Crookes, 48.

73. Praetorius, *Syntagma musicum II*, facs. ed. Gurlitt, 32; transl. and ed. Crookes, 44. Henry Prunières, "La Musique de la Chambre et de l'Écurie sous le règne de François Ier," *L'Année musicale* 1 (1911): 240.

TABLE 3. Comparison of proto-bassoon M1 with two basset shawms* (1 French inch = 27.07 mm; 1 line = $\frac{1}{12}$ inch)

Segment	M1 (inches)	M1 (mm)	no. 643 (mm)	no. 644 (mm)
Receiver-I	4.00	108.3	215	218
I-II	1.25	33.8	46	44
II-III	1.25	33.8	43	43
III-IV	4.50†	121.8	143	143
IV-V	1.25	33.8	46	49
V-VI	1.25	33.8	44	44
VI-VII	[7.50]‡	203.0	146	147
VII-VIII	[6.25]§	169.2	136	138
VIII-IX	6.25	169.2	80	74
IX-X	2.33	63.0	157	157
X-bell	[18.50]#	500.8	251	250
Overall bore	[54.33]	1470.7	1307	1307
Diameter of I-VI	3 lines	6.8	4.0-7.8	4.0-7.8

*These instruments, nos. 643 and 644 in the collection of the Musikinstrumenten-Museum, Berlin, are both signed "CR" and were acquired from the St. Wenzelskirche, Naumburg. They are briefly described (as "Tenorpommern") in Curt Sachs, *Sammlung alter Musikinstrumente bei der Staatlichen Hochschule für Musik zu Berlin: Beschreibender Katalog* (Berlin: Verlag von Julius Baird, 1922), col. 272. The measurements given here are from two photocopied, typescript measurement sheets provided through the courtesy of Bernd Wittenbrink of the Staatliches Institut für Musikforschung, Berlin. (No surviving basset shawms of French manufacture are known.) John Hanchet, an experienced maker of reproduction shawms, informed me that there is significant variation in size among surviving shawms that are nominally similar, and that bassets larger than the Berlin instruments are known to him (personal communication, August 2001).

†This is the measurement from *Harmonie universelle*, 300.

‡Mersenne's measurement here was 16 lines. See appendix 2 and table 1 for an explanation of my editing.

§Mersenne's measurement was 5 inches. Here a further 1.25 inches has been added for VII to transverse. See appendix 2 and table 1 for an explanation of my editing.

#See table 1 for the components of this sum. See appendix 2 for an explanation of my editing.

so, this might explain why many of its tone-hole locations differed from those of some basset shawms, even though M1 sounded in that approximate range.

The two tubular billets of M2's body appear stockier than those of M1, while the holes VIII, IX, and X and their associated keys appear closer together than the comparable keys on M1. Also, the bocal and reed of M2 appear noticeably larger in relation to its body than do those of M1. These differences, while difficult to quantify, all point in a similar direction: to the possibility that M2 was a smaller instrument than M1.

The next-smaller shawm size would be the alto. Praetorius documents only a one-key version, but at least one exemplar of a four-key version has survived: Berlin 290, which with its three extension keys had a lowest note of d.⁷⁴ It was apparently not used in the *Écurie*, where the *taille* (similar, but without the extended lower range) was favored. Mersenne's verbal description does not imply a difference in size between M1 and M2. But Trichet owned "*un jeu de bassons de quatre parties*." These instruments presumably corresponded to his comments:

[B]assons (except the *dessus*) are each composed of two tubes [billets] joined together, one a little smaller than the other in diameter and length. The wind descends through the smaller [tube], then ascends and leaves through the upper one. . . . The *dessus des bassons* has fewer tone-holes than the others, having only ten, while the others have twelve or thirteen. . . . [F]or convenience, the larger tubes [of the larger-sized instruments] may be dismounted and broken into two parts.⁷⁵

Thus Trichet's larger, multi-billet *bassons* may have included an alto or *taille*, to which M2 may have corresponded. Further differences between

74. "The alto bombard is very close in size to the schalmei, but it has one key, and is a 5th lower in pitch: it is called the *bombardo piccolo*." Praetorius, *Syntagma musicum II*, transl. and ed. Crookes, 47 and plate XI. "Der Altpommer/welcher fast einer grösse mit der Schalmeyen ist/ohne daß er ein Schlüssel hat/und eine *Quint* tieffer ist/wird *Bombardo Piccolo* genennet." Praetorius, *Syntagma musicum II*, facs. ed. Gurlitt, 37. Berlin 290 is described in Sachs, *Sammlung alter Musikinstrumente*, cols. 271–72. It is pictured in Anthony C. Baines and Martin Kirnbauer, "Shawm," *NGDMM* 23:231, fig. 4b.

75. ". . . les bassons (sauf celui du dessus) sont composés chacun de deux tuiaux joints ensemble, dont l'un est un peu moindre que l'autre en grosseur et longueur: par le moindre le vent descend, et puis s'en remonte et sort par le plus grand. . . . Le dessus des bassons a moins de trous que les autres, n'en ayant que dix et ceux des autres parties douze ou treze. . . . Les autres trous sont situés en divers endroits des plus grands tuiaux, lesquels pour la commodité se peuvent desmonter et se briser en deux parts." Lesure, "Le Traité des instruments," 367.

M2 and M1 are relatively minor: (1) a lower ferrule, C, is visible on M1, but not M2; (2) an upper ferrule is visible on M2 but not on M1; (3) key VII of M2 had a cover, C, lacking on M1.

Despite these disparities between the four proto-bassoons, Mersenne called all of them *bagots*, because their bores were folded. Although they represent two or more different sizes, he also called three of them *bassons*, because they played at least some bass lines.

Conclusions

On the basis of Mersenne's evidence, Richard Semmens concluded that "the bassoon was probably one of the first of the woodwinds to undergo extensive remodeling."⁷⁶ We can indeed discern a ferment of experimentation that likely continued for another generation after Mersenne's survey, during the development of the protomorphic oboe, as traced by Haynes. But we must reject the common assumption, discussed earlier, that Mersenne's proto-bassoons were descendants of the bass dulcian. It is reasonable to assume that instrument makers to the court of Louis XIII had been exposed to the conventional bass dulcian, yet they apparently spurned that elegant solution to the design challenge posed by a folded-bore bass woodwind. M1 and M2 were essentially anti-dulcians in their rejection of dulcian technology and embrace of shawm-based solutions.⁷⁷

It might be argued that the liturgical associations of the dulcian were so strong as to disqualify it from use within the *Écurie*. Yet the cornett, which had a similar liturgical association, was regularly used there. A second possible explanation is that the dulcian held some unfavorable foreign association for Louis XIII or his musicians. There is no shortage of candidates for this disfavor; topping the list would have been Louis's archrival, Spain, followed by the other Habsburg lands and allies that

76. Semmens, "The Bassoons," 30.

77. Outside the French court, meanwhile, at least two makers' outputs included both the bass shawm and the bass dulcian. The maker known by the mark *MH* made both a three-piece bass shawm, Nuremberg MI 97, and a bass dulcian, Braunschweig 84. Both are discussed in Kirnbauer, *Verzeichnis der Europäischen Musikinstrumente im Germanischen Nationalmuseum Nürnberg*, 2:116. The maker known by the mark *CR* made both a two-piece bass shawm, Berlin 642, and a bass dulcian, Berlin 654. See Sachs, *Sammlung alter Musikinstrumente*, col. 272; Barbara Stanley and Graham Lyndon-Jones, *The Curtal* (n.p., 1983), 6–7.

encircled France during the Thirty Years' War: the Spanish Netherlands and parts of Germany and Italy. A marked association of the conventional dulcian with these—or with still other disaffected parties, such as the French Protestants or England—is not presently known to me. But if it existed, the association would suffice to explain why Louis's instrument makers repeatedly resisted the dulcian design.

Yet in time the French makers began, if grudgingly, to borrow technologies from the dulcian. An influence from dulcian design was arguably present in the one-piece design of M3, although differences from the conventional bass dulcian were bold and numerous: M3 preserved the front-and-rear configuration of M1 and M2; hole VII connected to its down bore; its lower register was extended by means of an eleventh tone hole; its bocal was very short; and, most defiantly, it sported a decorative cleft that invoked the genuine faggoted design of M1 and M2. It would be difficult not to recognize the conventional dulcian as the inspiration for the side-by-side bore configuration of M4, yet the maker refused to accede fully to the conventional dulcian design. Except for the bore configuration, M4 preserved all the anti-dulcian features of M3, including a connection of hole VII to the down bore.

White's hypothesis of a faggoted shawm is a useful concept or schema, suggesting a likely inspiration for Mersenne's proto-bassoons. Yet not one of the four instruments was a strict realization of the faggoted-shawm concept. The tone holes of M1 were variously raised and lowered along the length, as compared to a genuine shawm, to the point that its natural scale remains a mystery. M2 lacked a shawm-like bell; M3, apparently a later design, was not faggoted but rather a one-piece instrument. The side-by-side configuration of M4, apparently a still later design, allowed for chimneys as long as those of a conventional dulcian. A philosopher might reasonably view these instruments as obvious transformations of shawms, but a practical woodwind maker would not.

White offered a second bold theory that threatened to set the commonly imagined prehistory of the bassoon on its ear:

Rather than a step in the evolution towards a sectioned instrument, the dulcian seems more likely to have been a design improvement on an earlier sectioned bass instrument, bringing to it a combination of solid body and obliquely drilled tone holes.

He posited that an unnamed maker "towards the end of the sixteenth century, first cut a bass shawm in half, folded it over, and joined the two

bores together.”⁷⁸ If this shawm constituted the “earlier sectioned bass instrument,” then the known dates of shawm and dulcian production undermine White’s hypothesis: the *fagotto* was documented in Italy by 1516 and the *bajone* in Spain by 1530, both instruments apparently conventional dulcians.⁷⁹ Unless evidence emerges of earlier sectioned bass instruments, White’s theory remains speculative.

M4 probably was not an immediate precursor of the three-key, four-piece, late-baroque bassoon. Some noteworthy influence seems likely, but there may well have been later, intervening stages of development. The three-key, three-piece instrument pictured and described circa 1688 by Randle Holme, for example, was possibly of French design and manufacture.⁸⁰ If it was, however, numerous differences still distinguished it from M4. Even innovation at the brisk pace documented by Mersenne’s variety of proto-bassoons would presuppose several more models before a design comparable to the Holme instrument was reached.

One crucial element of reform was apparently lacking in the Mersenne instruments: a general lowering of the consort’s pitch. This would later be achieved, in part, by lowering the tone holes on each instrument’s bore and reducing the diameters of the tone holes. The tone holes of M1 and M3, the two instruments for which Mersenne gave measure-

78. White, “The Bass Hautboy,” 168; White ventured to link iconographic images of two “sectioned dulcian-like basses” to the faggoted shawm tradition: (1) Jan van der Straet’s engraving in Philipp Galle, *Encomium musices* (Antwerp, [ca. 1590]), and (2) Bernardo Bitti’s organ painting “La Asunción de la Virgen,” Convento de La Merced, Cuzco, Peru. But neither of the illustrated instruments appears to share the front-and-back configuration of M1, M2, and M3. Nor does a surviving three-piece dulcian (no. C 201, apparently Italian in origin) in the Kunsthistorisches Museum, Vienna. Moreover, the Vienna and Bitti instruments were esthetically opposed to Mersenne’s instruments in a significant way. Whereas the makers of the Mersenne instruments were at pains to flaunt the real or vestigial faggoted structure, the maker of Vienna C 201 sought to minimize it. That is, the footprint of the Viennese tenor joint was crescent in shape, so that it wrapped unobtrusively around the long joint. This was apparently true of the Bitti instrument, and arguably true of the van der Straet instrument. Such an esthetic polarity suggests that the Mersenne instruments belonged to a separate tradition. The Bitti and van der Straet images were reproduced and discussed in White, “The Bass Hautboy,” 170. The latter was also reproduced in Gottfried S. Fraenkel, *Pictorial and Decorative Title Pages from Musical Sources* (New York: Dover, 1968), 39. Vienna C 201 was pictured and described in Julius Schlosser, *Die Sammlung alter Musikinstrumente: Beschreibendes Verzeichnis* (Vienna: Kunstverlag Anton Schroll, 1920), 82–83 and Tafel xxxviii.

79. Waterhouse, “Bassoon,” 877, 880.

80. The Holme illustration was reproduced and discussed in James B. Kopp, “The Emergence of the Late-Baroque Bassoon,” *The Double Reed* 22/4 (1999): 74.

ments, were neither lower nor smaller than those of analogous shawms. And since the instruments could be joined in the shawm band, as Mersenne said, the pitch was still apparently at the old *ton d'Écurie*.⁸¹

The unnamed maker or makers of the one-piece M3 and M4 labored to invoke the faggoted structure of the two-piece M1 and M2. It is tempting to see in this nostalgic impulse a seed that would eventually blossom into the separate tenor and long joints of the baroque (and modern) bassoon; no clearer inspiration for that innovation is to be found among known woodwinds. But the seed was not to flower conspicuously for some decades.

The collector Trichet, a friend of Mersenne, owned three *bassons*, apparently similar to Mersenne's proto-bassoons, by 1631. But bassoon-like instruments were absent from Jean Le Pautre's engraving of Louis XIV's coronation ceremony in 1654, the lower voices being taken by sackbutts and two unfolded instruments that may have been *chromornes* or shawms. Nor was any sort of bassoon visible in the Gobelins tapestries (designed 1664), which introduced new transitional oboes, as well as the *basses de cromorne* that apparently accompanied them.⁸² By 1668, when Nicolas Hotteterre played *basson* in the royal chapel, we can be reasonably sure that his instrument was at the lower "singer's pitch." Whether his instrument was a conventional late-baroque bassoon, or instead some undocumented offspring of the Mersenne instruments, we can only attempt to imagine.

Apparently the proto-bassoons illustrated by Mersenne enjoyed only short working lives. But their boldly innovative designs pointed, for the first time in documented history, toward distinctive aspects of the definitive bassoon layout, which has changed little over more than three centuries. The *basse de hautbois de Poitou* and three of the four proto-bassoons are the only clear models for the eleventh tone hole, which distinguished baroque and later bassoons from comparable shawms and dulcians. Associated with the extended lower range was a towering bell, which

81. "... ces especes de Basses ... se peuuent ioindre au Concert des Hautbois. ..." Mersenne, *Harmonie universelle*, 298. For a discussion of this topic, see Haynes, *The Eloquent Oboe*, 22–27.

82. Lesure, "Le Traité des instruments," 286, 367. The Le Pautre engraving was reproduced in Guy Oldham, "Two Pieces for 5-Part Shawm Band by Louis Couperin," in *Music Libraries and Instruments* (London and New York: Hinrichsen Edition, 1961), plate 102, and in François Fleuret, *Le Hautbois dans la musique française 1650–1800* (Paris: Picard, 1984), plate V. On the Gobelins tapestries, see Haynes, *The Eloquent Oboe*, 30.

probably contributed to the revised bore configuration and playing position of M4.

The wing joint of the bassoon, an ingenious contrivance of deep finger holes in a largely cylindrical corpus, arose from an unidentified source in the era after Louis XIII. Even though obliquely bored tone holes were common on shawms, as Mersenne noted, the very long chimneys of M4, like those of the conventional dulcian, were technological advantages, increasing both comfort and acoustical propriety. Possibly the bassoon's wing joint came about as a thoughtful hybrid, a patriotic reconciliation of the dulcian's deeper chimneys and comfortable playing position with the cherished look of the folded shawm. The ramified joints of the late-baroque bassoon may be seen as an echo of the folded shawm, even if the earlier vogue for this style under Louis XIII remains an unexplained fact.

APPENDIX 1

Bibliographical Notes on Mersenne's Writings

The chronology of Marin Mersenne's writings on musical instruments is deceptive and the kinship among different versions potentially confusing, so a brief explanation may be useful. According to Wolfgang Köhler, the printing of *Harmonie universelle*, which bears the date of 1636, was begun in 1634 and completed only in 1637.⁸³ From this French work, Mersenne prepared a condensed version in Latin containing the same illustrations, *Harmonicorum libri in quibus agitur de sonorum natura, causis, & effectibus: de consonantiis, dissonantiis, rationibus, generibus, modis, cantibus, compositione, orbisque totius harmonicis instrumentis*. Copies of this slightly later work bear the date of 1635 or 1636. Though shorter, the Latin version occasionally contains details not included in the French.⁸⁴

The Latin books on instruments contained a separate title page, *Harmonicorum instrumentorum libri IV*. Surviving copies of the books on instruments are sometimes bound alone (Paris, Bibliothèque Nationale, for example), but other times bound together with the books of theory, *Harmonicorum libri in quibus agitur . . .* (New York Public Library, for example). The latter is also sometimes bound alone (a copy in Paris, Bibliothèque Nationale, for example, which contains notes in Mersenne's own handwriting). In later editions of 1648 and 1652, the eight books of theory and the four books of instruments were brought together as *Harmonicorum libri XII*.⁸⁵ In all editions, the books on instruments were separately paginated. Hellmut Ludwig gave further details:

83. Köhler, *Die Blasinstrumente*, 22–23.

84. Mersenne, *Harmonie universelle*, facs. ed. Lesure, 1:vii.

85. There is a modern facsimile of the 1648 edition (Geneva: Minkoff, 1972).

Three editions of *Harmonicorum libri* are to be distinguished. The one of 1635 and 1636 [the title pages of some exemplars read 1635, others 1636, with no difference in content] consists of two parts, of eight and four books, respectively [of 183 and 165 pages]. The first part bears the title *Harmonicorum libri* [without enumeration of the books] *in quibus agitur de sonorum natura, causis, & effectibus: de consonantiis, dissonantiis, rationibus, generibus, modis, cantibus, compositione, orbisque totius harmonicis instrumentis*. The second part is called *Harmonicorum instrumentorum libri IV in quibus fusè satis agitur de monochordis, variisq. citharis, barbitis, lyris, tubis, clavicordis, campanis, cymbalis atque tympanis* (Paris, 1635 and 1636). The first part has no conclusion; the treatment of instruments announced in the title is found only in the second part, so that this is to be understood as an immediate continuation.

Two further editions date from the years 1648 and 1652 with the title *Harmonicorum libri XII* [with enumeration of the combined books: $8 + 4 = 12$] *in quibus agitur* etc., as in the title of the first part, 1635/6. Corresponding completely to the two parts of the earlier edition, they are thus only a compilation, but with a new dedication and new foreword. A brief supplement, the "Liber novus praelusorius," found before the instrumental part, is insignificant in content, adding only a few non-essential remarks to what was already said.⁸⁶

86. Von den "Harmonicorum Libri" sind drei Ausgaben zu unterscheiden. Die eine von 1635 und 1636 [manche Exemplare . . . haben auf dem Titel die Jahreszahl 1635, andere haben 1636. . . Inhaltlich besteht keinerlei Verschiedenheit] besteht aus zwei Teilen zu acht und vier Büchern [von 183 bzw. 165 Seiten]. Der erste Teil trägt der Titel: "Harmonicorum Libri [ohne Zahl der Bücher] in quibus agitur de Sonorum Natura, Causis & Effectibus: de Consonantiis, Dissonantiis, Rationibus, Generibus, Modis, Cantibus, Compositione, orbisque totius Harmonicis Instrumentis." Der zweite Teil heißt: "Harmonicorum Instrumentorum Libri IV in quibus fusè satis agitur de Monochordis, Variisq. Citharis, Barbitis, Lyris, Tubis, Clauichordis, Campanis, Cymbalis atque Tympanis," Paris 1635 und 1636. Der erste Teil hat keinen Abschluß; die in seinem Titel angekündigte Behandlung der Instrumente erfolgt erst im zweiten Teil, so daß dieser als unmittelbare Fortsetzung zu verstehen ist.

Zwei weitere Ausgaben stammen aus den Jahren 1648 und 1652 mit dem Titel: "Harmonicorum Libri XII [hier Angabe der Zahl der zusammengefaßten ($8 + 4 =$) 12 Bücher] in quibus agitur usw. wie der Titel des ersten Teiles von 1635/6. Sie stimmen mit den beiden Teilen dieser Ausgabe vollständig überein, sind also nur eine Zusammenfassung, aber mit neuer Widmung und neuem Vorwort. Eine kleine Ergänzung, der "Liber Novus Praelusorius," findet sich vor dem instrumentalen Teil, ist aber inhaltlich unbedeutend, da sie nur einige unwesentliche Bemerkungen zu dem schon Gesagten bringt." Hellmut Ludwig, *Marin Mersenne und seine Musiklehre* (Halle: Buchdruckerei des Waisenhauses, 1934), 27. Ludwig's footnotes are incorporated into the text here inside brackets.

APPENDIX 2

Conventions of Terminology

Mersenne's style of numbering tone holes varied from instrument to instrument. To facilitate discussion, the following scheme, well known to students of woodwind instruments, is used instead. The numbering proceeds from the uppermost tone hole downward: I to III (upper hand) and IV to VI (lower hand). The remaining tone-holes follow a similar logic, descending on the bass shawm from VII and VIII for the lower-hand little finger, to IX and X for the lower thumb keys. XI, if present, was an ungoverned tuning hole near the shawm's bell. I occasionally use arabic numerals to quote Mersenne's own words.

Unlike a tone hole, a tuning hole served to enhance pitch stability and volume by reinforcing partials of various tones. On the *dessus de hautbois*, Mersenne called the elongated section between VII (the lowest tone hole) and the bell opening the *pate*, or foot. Up to five tuning holes might be present. On some larger shawms, the equivalent portion below VII contained tone holes governed by keys. Modern writers call these features the bore extension and extension keys. In addition, one or two tuning holes were sometimes present.

On the conventional dulcian and on Mersenne's proto-bassoons (M1 through M4), VII was the tone hole controlled by the lower-hand, little-finger key. The portion of the bore through hole VI (conventional dulcian and *basse de hautbois de Poitou*) or VII (M1 through M4) is called the down bore. The bore reversed direction at a connecting cavity, here called the transverse link, and ascended through the up bore toward the bell. Along this up bore, holes VIII and IX were controlled by the lower thumb, while X and (except on M2) XI were controlled by the upper thumb. M1 and M2 had tuning holes, here called XII and XI, respectively.

A given tone hole acted as primary vent when all the tone holes above it were closed with fingers or keys. The pitch venting from primary vent VII, for example, was called the six-finger pitch. Since the time of Praetorius, this has been a frequent standard of comparison, because smaller sizes often lacked keys or a low-register extension. A tuning hole by definition did not act as a primary vent.

I occasionally refer to the outer construction and outer appearance of multipartite instruments by the number of wooden billets required to construct them, usually one or two, and sometimes a third billet for a detachable bell, if present. A "faggoted" instrument has the appearance of a bundle of sticks, traditionally known as a faggot or fascine. When speaking of a conventional dulcian, I refer to its flatter (front and back) surfaces as elliptical, and its more convex (left and right) surfaces as parabolic. Tone holes drilled on the bias are sometimes called chimneys, emphasizing their deceptive length. The socket into which an instrument's crook, or bocal, was inserted is called the receiver.

Mersenne's unit of measurement was the French foot or *pied de roi*, equal to 324.8 mm. The French inch, or *pouce*, was equal to 27.07 mm.⁸⁷ The line, or

87. See Lewis Van Hagen Judson, "Measures and Weights," *Encyclopaedia Britannica* (Chicago: Encyclopaedia Britannica, Inc., 1949) 15:141.

ligne, was equal to one-twelfth of a *pouce*. Unless otherwise noted, references in this article are to these French feet and inches, so that the discussion can proceed in Mersenne's own terms. Mersenne's measurements between tone holes are assumed to extend from center to center.

APPENDIX 3

Notes on Specific Instruments

Bass Dulcian. In all likelihood, this was the instrument used in choir schools in provincial France. Its one-piece body had six finger holes on the front (finger) surface, connecting to the down bore. Hole VII and its key were sited on the front surface, but connected to the up bore. A second open key and two open holes were sited on the back (thumb) surface and connected to the up bore. On a dulcian, all the tone holes were chimneys, that is, drilled on the bias in order to connect with the appropriate bore and to bring their openings within easy control of the fingers and thumbs. Appearing on the elliptical surfaces of the dulcian's body, the tone holes appeared to run perpendicular to the transverse link within, but they in fact ran diagonal to it. No dulcian is pictured by Mersenne.

Basse de Hautbois de Poitou (*Harmonie universelle*, 306; *Harmonicorum instrumentorum libri IV*, 90). Mersenne gave no measurements for this instrument, whose layout of tone holes differed from that of the proto-bassoons he described. The down bore was shorter, ending after hole VI. Holes VII and IX appear to have been governed by the palms of the player's hands. See the discussion in the text above for an argument that the *basse*, unlike the *dessus*, was usually played with its windcap.

Harmonie universelle offered two clues to the range and fingering of the instrument. First, Mersenne said that "the range of each of these *hautbois* [*de Poitou*] is similar to that of the *Grands Hautbois*." Second, he gave the fingering for G as "all closed," and F (i.e., f) as "all open, without the key." The redundant wording of the fingering for f was obviously a mistake, probably due to a misplacement of the phrase "without the key," as *MGG* noted.⁸⁸ Correcting the G fingering to "all closed, without the key," yields the noted similarity to the bass shawm of the *Grands Hautbois*.

Bass Shawm (*Harmonie universelle*, 297 and 302; *Harmonicorum instrumentorum libri IV*, 85 and 88). Mersenne wrote that the bass measured 5 feet from receiver to bell opening, or 1,624 mm. This is approximately 8 French inches shorter than at least two surviving bass shawms: Berlin 642 measures 1,855 mm, and Nuremberg 97 measures 1,843 mm.⁸⁹ But surviving instruments vary widely in size, so that highly specific extrapolations of pitch from size cannot easily be

88. Masel, "Doppelrohrblattinstrumente," col. 1372.

89. See Sachs, *Sammlung alter Musikinstrumente*, col. 272; Kirnbauer, *Verzeichnis der Europäischen Musikinstrumenten*, 2:115.

made. Indeed, Mersenne's explanation of the bass shawm's pitch agreed with conventional notions: in the bass voice of his six-voice sample score, he gave the fingering for G as "all [six fingers] closed without the keys."⁹⁰

Mersenne numbered the first of his illustrations erroneously: a superfluous numeral 7 led him to count eleven tone holes, rather the correct number of ten. The second illustration was numbered correctly.

M1 (*Harmonie universelle*, 298 [left]; *Harmonicorum instrumentorum libri IV*, 86 [left]). Mersenne's measurements for M1, summarized in table 1, are incomplete and otherwise problematic. A complete and believable instrument can be represented through the measurements only if certain assumptions and corrections are made. First among the difficulties is a lacking measurement for the interval X–XI, which is ignored in both texts. Second, there is a discrepancy for the interval from III–IV between the Latin (3.5 inches) and the French (4.5 inches). Third, Mersenne gave a measurement of 5.5 inches from XII to the end of the tenon concealed inside the bell, without specifying the length of the tenon itself. Fourth, Mersenne's measure for VI–VII was impossibly small—16 lines, or 1.33 inches—in both texts. Fifth, Mersenne's measurements from XI to the bell end suggest an improbably large expanse of 20 inches, much longer than the comparable expanse on a basset or even a bass shawm. But plausible explanations may be offered in each of these instances.

A usable design would have demanded that the two thumb holes, XI and IX, be sited roughly opposite the respective holes for the index fingers, I and IV. Since we know that I lay 7 inches above IV, we can assume that XI lay roughly seven inches above IX (that is, seven inches closer to the bell). Since we also know that IX to X is equal to 2.33 inches, we can then deduce that the missing measurement for X to XI was roughly 4.67 inches.

The second discrepancy, that of III–IV, is less a matter of an obvious error than a choice between two plausible values. The *Harmonie universelle* measurement of 4.5 inches yields a span similar to that of a basset shawm, while the *Harmonicorum instrumentorum libri IV* measurement of 3.5 inches yields a smaller span, closer to that of a tenor shawm. For my drawing, I have opted for the larger value, which accords better with the very large up bore measurements Mersenne gave. Third, I have arbitrarily assumed that the length of the tenon concealed inside the bell is two inches, so that XII to the bottom edge of the bell is equal to 3.5 inches.

Fourth, Mersenne's measurement of 16 lines (1.33 inches) for VI–VII was an absurdly small distance. Harris and Lyndon-Jones speculated that 16 lines was the distance from VI to the touch piece of key VII, which is conceivable, but uncomfortably large for such a span.⁹¹ More likely, this impossibly small measurement for VI to VII was an erroneous transposition of the improbably large measurement given for XI to XII, 7.5 inches, which was fifth in our enumeration of problems with Mersenne's numbers. (Such an error becomes easily understandable if we hypothesize that Mersenne's pre-publication notes made use of

90. "... G re sol tout fermé sans les clefs." Mersenne, *Harmonie universelle*, 304.

91. Lyndon-Jones and Harris, "Reconstructing Mersenne's *Basson* and *Fagot*," 15.

Roman numerals, so that the notation “VI to VII” differed only minimally from “XI to XII.”) Reversing Mersenne’s measurements for these two intervals yields an instrument free of these dual absurdities.

Finally, I have assumed that Mersenne made one further error, not obvious at first reading, in mislabeling the distance between VII and VIII. The presumed error is analogous to a mislabeling more easily noticeable in the description of M3, where Mersenne’s measurements were complete. Briefly, I assume that Mersenne’s measurement of 5 inches “from VII to VIII” was in fact the measurement from the transverse (up bore side) to VIII. (See the discussion of M3 below for further explanation.) This gives a measurement from up bore transverse to IX of 11.25 inches. Since I also assume, as explained above, that IV is sited opposite IX, then we can deduce a missing value of 1.25 inches for VII to transverse (down side). I assume that the transverse link lay 0.5 inches above the butt, as was true of M3, according to my interpretation.

We may then proceed to offer the following schematic diagram of M1. (See figure 7.) Measurements that required correction or hypothesis are given in brackets. A very long and widely flared, shawm-like bell was noticeable in Mersenne’s illustration and description of M1. Since Mersenne gave no measurement for the bell diameter, I have arbitrarily assigned it a diameter of 4 inches, which accords with the illustrated proportions vis-à-vis the 1.25 inch bell tenon, as well as those of surviving basset shawms. The forked touches for keys VIII, IX, X, and XI of M1, which are of no advantage to the player, seem explainable only as vestiges of key VIII of the shawm. The shawm’s VIII key had to be forked to allow the use of left or right hand, as the player chose.

M2 (*Harmonie universelle*, 298 [right]; *Harmonicorum instrumentorum libri IV*, 96 [right]). Mersenne gave no measurements for M2.

M3 (*Harmonie universelle*, 300; *Harmonicorum instrumentorum libri IV*, 87). M3 apparently had a compass similar to that of the bass shawm, except that it could reach a tone lower, to BB-flat. Mersenne gave detailed measurements for M3, which are summarized in table 2. Still, we must quote passages in order to correct certain obvious errors. His French text reads:

[The torso, minus bell and crook] would be $5\frac{1}{2}$ feet long, if it were unfolded, that is to say if the two bores BD and DH were continued in a single straight line. From B to D is $2\frac{3}{4}$ feet, and likewise from B [rightly D; see below] to the beginning of bell H, which is 8 inches long.

Mersenne’s slip in French was not present in the Latin: “[T]he length BD, and DH is $5\frac{1}{2}$ feet: BD is $2\frac{3}{4}$ feet: the bell BH is 8 inches.”⁹² Another apparent

92. “Je dis donc premierement qu’il auroit cinq pieds & $\frac{1}{2}$, s’il estoit desployé, c’est à dire si les deux canaux BD, & DH estoient continuez en vne mesme ligne droite; qu’il a deux pieds $\frac{3}{4}$ de B en D, & de B en H, qui monstre la hauteur de sa boëtte, qui a huit pouces.” Mersenne, *Harmonie universelle*, 300. “. . . longitudo BD, & DH est pedum $5\frac{1}{2}$: BD pedum $2\frac{3}{4}$: Codon BH est 8 digitorum.” Mersenne, *Harmonicorum instrumentorum libri IV*, 86.

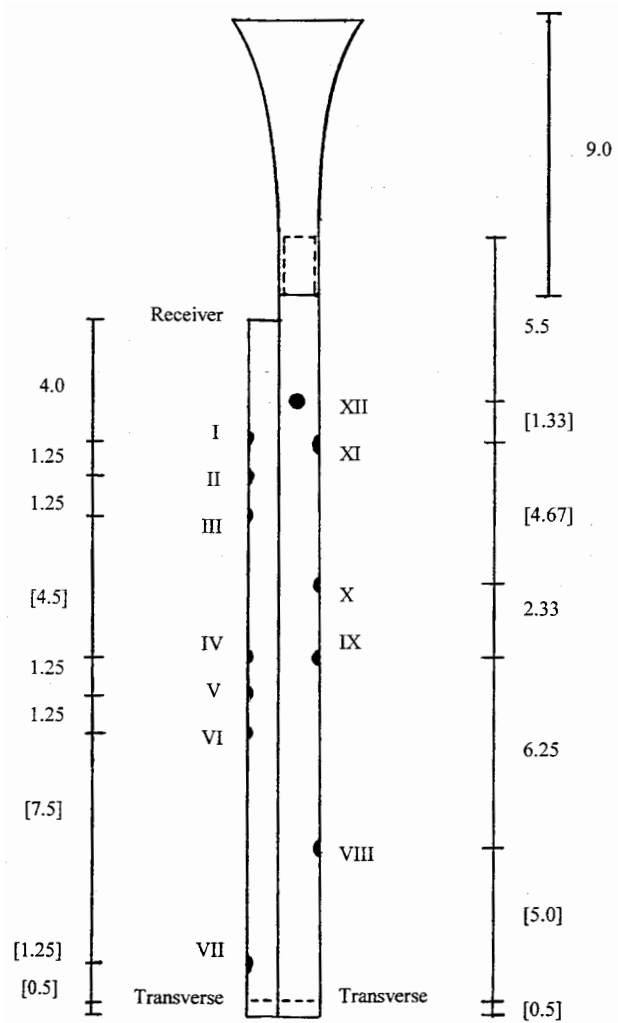


Figure 7. Tone hole locations of the proto-bassoon M1 drawn approximately to scale, subject to revisions explained in appendix 3 and table 1. (Figures 7 and 8 are here reproduced to the same scale.)

error, however, is present in both originals. The Latin reads: "Finally 11 to B [rightly H] is 14 inches." The French reads: "[F]rom this eleventh hole [hole XI] to the bell, that is to say B [rightly H], there are 14 inches." Only by reading H (the height of the bell's top) for B (height of the bell's bottom) do the sums of Mersenne's interstitial measurements agree with his overall length of $5\frac{1}{2}$ feet for the torso.⁹³

The discrepancy between Mersenne's own down-bore measurement (33 inches) and the sum of his component measurements from receiver to VII (30.5 inches) suggests that VII lay 2.5 inches above the butt. But Mersenne's up-bore measurements do not quite balance with this unless a correction is made. It appears that his four-inch measurement between VIII and VII was rightly for VIII to the transverse cavity (up-bore side), which is in fact a more logical point of reference. This adjustment locates the transverse cavity a plausible one-half inch above the butt, and balances the corrected component measurements with Mersenne's own overall length measurements.

M3's sounding length, including bell but excluding crook, was 73 French inches or 1,976 mm, according to our interpretation of Mersenne. This was longer than the Berlin bass shawm no. 642, which has a body length of circa 1,855 mm, or the Nuremberg bass shawm MI 97, which has an overall length of 1,843 mm. This greater length is to be expected, given that M3 descended a tone lower than the bass shawm. The following drawing takes the above corrections into consideration. (See figure 8.)

M4 (*Harmonie universelle*, 302; *Harmonicorum instrumentorum libri IV*, 88). One detail of the French text needs correction: a darkened circle without label above key touch V signified open hole IX. Mersenne mistakenly referred to this as the "seventh hole." It is in fact the ninth if one counts from the receiver, but lies between holes 2 and 3 as numbered in the plate.

Trichet's Bassons. Pierre Trichet wrote an inventory of his instrument collection in 1631, including a set of four *bassons*.⁹⁴ These instruments presumably influenced the descriptions he wrote, between 1630 and his death in 1649, in his "Traité des instruments." (The *bassons* were not pictured.) He noted that

Bassons (except the *dessus*) are each composed of two tubes joined together, one somewhat smaller than the other in breadth and length; the wind descends through the smaller tube, then ascends and leaves through the larger one. Furthermore, the *basson* lacks the *fontanelle* with which the shawm is fitted. It is true, however, that at the cut, in order to open and close the most

93. "... denique 11 a B digitis 14." Mersenne, *Harmonicorum instrumentorum libri IV*, 86. "... et de cet vnziesme iusques à la pate, c'est à dire iusques à B, il y a quatorze pouces." Mersenne, *Harmonie universelle*, 301.

94. "Un jeu de bassons à quatre parties." Pierre Trichet, *Synopsis rerum variarum* (Bordeaux, 1631), quoted in Lesure, "Le Traité des instruments," 286.

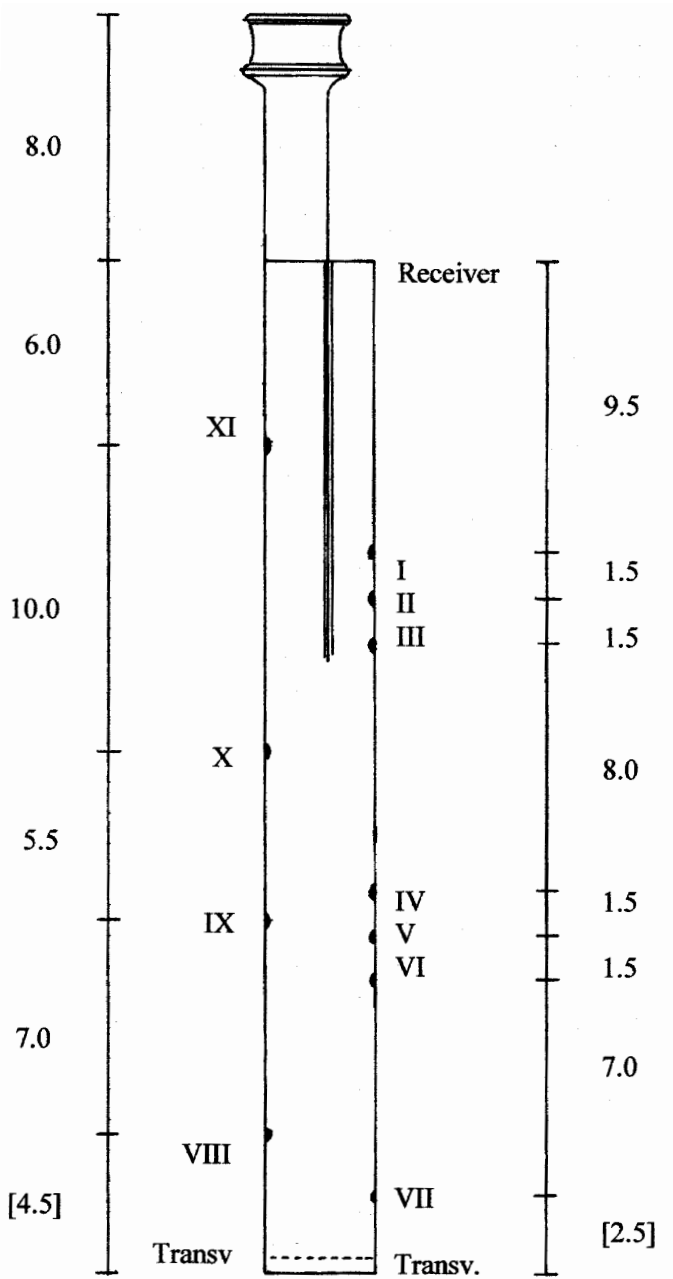


Figure 8. Tone hole locations of the proto-bassoon M3 drawn approximately to scale, subject to revisions explained in appendix 3 and table 1.

remote hole, there is a key or brass spring, covered by a long brass cover perforated in several places. The *dessus des bassons* has fewer holes than the others, having only ten while the others have twelve or thirteen. The six nearest the receiver are always located along the smaller tube in a straight line and equally spaced, except that the third and fourth are somewhat more separated. The other holes are sited in different places along the larger tubes, which can be dismantled for convenience and are broken into two parts. But one must be careful to reassemble them in the correct position for use, and to arrange correctly the curved brass bocal, on which is positioned the reed. . . . The *tarot* resembles the *basson* somewhat, having two tubes or channels through which the air descends and reascends.⁹⁵

Trichet's *dessus des bassons* is consistent with the description of a conventional descant or treble dulcian. In describing the larger *bassons*, Trichet mentions hole VII and its key first, then holes I through VI. Thus we may reasonably assume that "the other holes . . . sited in different places along the larger tubes" are holes VIII through XII (or XIII, when present). Given this assumption, his larger instruments seem similar to Mersenne's proto-bassoons in important ways: (1) they had twelve or thirteen holes, indicating an extended lower range, (2) they had a "cut" below hole VII and its key, suggesting the faggoted-shawm design, and (3) they had dismountable larger tubes, presumably meaning detachable bells. A puzzle of the text is why "one must be careful to reassemble" the long joints "in the correct position for use." Possibly Trichet was simply being fastidious about affixing the bell; otherwise, a more complex structure may be indicated.

If the above interpretation is valid, then proto-bassoons similar to Mersenne's can be documented about five years earlier than Mersenne's publications.

95. ". . . les bassons (sauf celui du dessus) sont composés chacun de deux tuiaux joints ensemble, don't l'un est un peu moindre que l'autre en grosseur et longueur: par le moindre le vent descend, et puis s'en remonte et sort par le plus grand. D'ailleurs, ils n'ont point au milieu cette boëte pertuisée tout à l'entour qu'on met aux hautbois. Il est vrai qu'à la partie de la taille on y met, pour ouvrir et fermer le trou plus esloigné, une clef ou ressort de cuivre couvert d'un boëte aussi de cuivre, longe et pertuisée en quelques endroits. Le dessus des bassons a moins de trous que les autres, n'en ayant que dix et ceux des autres parties douze ou treze, dont les six premiers vers l'orifice sont toujours placés sur le moindre tuiau en droite ligne et part esgale distance, sauf que le troisieme et quatrieme trou s'esloignent davantage. Les autres trous sont situés en divers endroits des plus grands tuiaux, lesquels pour la commodité se peuvent desmonter et se briser en deux parts. Mais il faut estre soigneux des les remettre justement en leur place lorsqu'on veut s'en servir et de bien ranger les cuivrins courbés ou sont insérées les onches. . . . Le tarot ressemble en quelque façon au basson, ayant deux tuiaux ou canaux pour faire descendre ou remonter le vent." Lesure, "Le Traité des instruments," 367-68.