HAVE YOU EVER FOUND AN OBOE AND WONDERED WHERE IT CAME FROM?

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Abstract

The history of an oboe which was donated to the Open University Acoustics Research Group is traced. The oboe's keywork is shown to be an interesting development of the Triébert Système 3. Whilst the lower joint appears to be identical to that of a Système 3 instrument, the upper joint contains modifications which make it more advanced. As the oboe's keywork lies somewhere between Triébert Systèmes 3 and 4, the date of the instrument's manufacture can be established as the mid-19th century.

To investigate the acoustical properties of this 19th century oboe, input impedance and sound spectra measurements carried out on the instrument are compared with measurements made on a more modern instrument.

INTRODUCTION

In this paper, the history and acoustical properties of an oboe donated to the Open University Acoustics Research Group are investigated. The instrument was discovered by a colleague in the early 1980s in a laboratory at the University of Newcastle. It is made out of Indian rosewood rather than the African blackwood used almost universally in modern manufacture. However, it is the keywork which really distinguishes the instrument from present day oboes.

The paper is split into two main sections. In the first section, the period in which the instrument was manufactured is established through inspection of the keywork. In the second section, input impedance and sound spectra measurements are presented and used to compare the instrument's playing characteristics with those of a modern oboe.

ESTABLISHING THE ORIGIN OF THE INSTRUMENT

At the beginning of the 18th century, a typical oboe would have been made up of three joints (upper, lower and bell) and would have had six finger holes, one or two small closed keys, and a large open key. Such two and three keyed instruments were used for the majority of the century with very little change. Although additional keys began to be introduced towards the end of the century, it wasn't until the 19th century that the oboe became truly mechanised.

By 1825, a new oboe would have had up to sixteen holes, of which as many as ten would be controlled by keys. It was around this time that the oboe began to develop along the two separate lines which would finally lead to the French and German instruments.

The development of the French oboe is dominated by the work of the Triébert family. Between 1810 and 1878, the Triéberts (Guillaume and his two sons, Charles-Louis and Frédéric) were responsible for a complete transformation of the instrument. The proportions of the bore were altered, the sizes and positions of the note holes were changed, and numerous mechanical improvements were made. In total, the family created six different models or "systèmes".

It is to this period of development that the subject of this study, the rosewood oboe, can be traced.

By comparing the photographs of the rosewood oboe in Figures 1 and 2 with the sketches of the Triébert Systèmes shown in Figure 3, it can be seen that the lower and bell joints are identical to those of the Triébert Système 3 instrument. Features to note include the B_3 and duplicate $E\flat_4$ keys (where C_4 is middle C) which are operated by the left hand little finger using long levers. The B_3 key is located on the bell joint. By Système 4, the B_3 key had been moved to the lower joint and the long levers

Figure 1: Rosewood oboe (upper, lower and bell joints)

Figure 2: Rosewood oboe (top) and Buffet Crampon oboe (bottom)

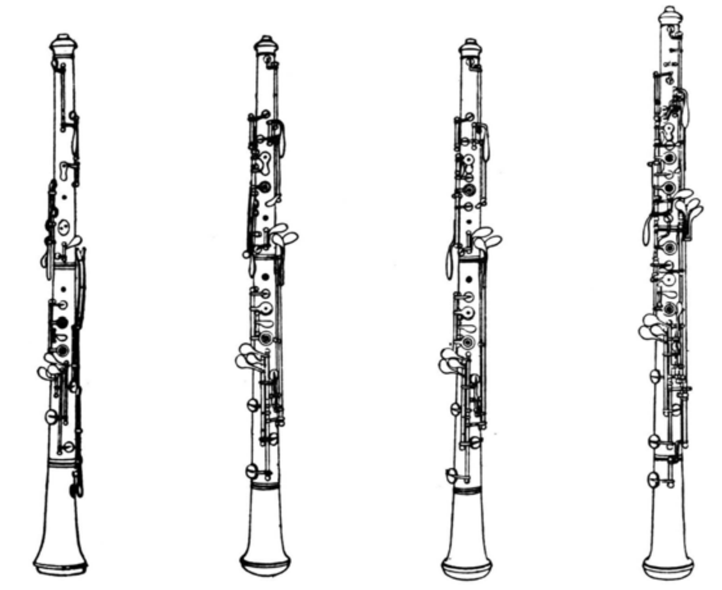

Figure 3: Triébert Systèmes 3 to 6 (adapted from Bate 1956 [1])

replaced by a single axle which, when moved one way, closed the B_3 key and, when moved the other way, opened the $E\flat_4$ key.

The upper joint of the rosewood oboe is similar to that of the Système 4 instrument. However, some of the keywork appears to have more in common with Système 3. For example, on the rosewood oboe, the axle about which the half hole plate (operated by the left hand index finger and used for playing $C\sharp_5$) pivots, is positioned to the left of the hole from the player's point of view. This is also the case on the Système 3 instrument whereas by Système 4 the axle had been moved to the right of the hole. Interestingly, on the rosewood oboe, the axle about which the ring operated by the left hand second finger pivots is also positioned to the left of the hole. This ring doesn't appear at all on the Système 3 instrument and on the Système 4 instrument the axle is to the right of the hole. The other way that the upper joint of the rosewood oboe differs from that of the Système 4 instrument is in the positioning of the two octave keys which is, in fact, the same as on the Système 3 instrument.

A comment should also be made about the two levers which are operated by the right hand index finger and used to open the C_5 and $B\flat_4$ keys. In Système 5, these levers were replaced by a left hand thumb plate mechanism which, when released, opened the keys. Although it would gain popularity in later years, the thumb-plate mechanism was disliked by many players of the day. As a result, a new mechanism was developed which saw a return to the C_5 and $B\flat_4$ keys being operated by the right hand index finger. This mechanism appeared for the first time on the Triébert Système 6 instrument. This type of French oboe without the thumb-plate is termed the "Conservatoire" model.

It is clear that the rosewood oboe appears to fall somewhere between Triébert Systèmes 3 and 4. Système 3 was introduced circa 1840, while Système 4 appeared around the time of Guillaume Triébert's death in 1848. This indicates that the rosewood oboe was made in the mid-19th century.

Finally, it should be noted that the rosewood oboe does exhibit maker's marks (740, C, LP). Although attempts to identify the maker have so far proved unsuccessful [2], the letters LP indicate that the instrument is designed to play at 'low pitch' (that is, A_4 = 435 Hz, some 20 cents flatter than the present International Standard Pitch of A_4 = 440 Hz).

INVESTIGATING THE ACOUSTICAL CHARACTERISTICS OF THE INSTRUMENT

In order to investigate the playing properties of the 19th century rosewood oboe, input impedance and sound spectra measurements have been carried out on the instrument and are compared here with measurements made on a modern Buffet Crampon oboe. All the measurements were made at room temperature (20°C) with the staple fully inserted.

The first thing to note is that the rosewood oboe is approximately 3.5 cm shorter than the Buffet Crampon oboe (see Figure 2). Consequently, the lowest note available on the rosewood oboe is B_3, compared with the $B\flat_3$ available using the Buffet Crampon instrument.

Figure 4 shows impedance curves for the two oboes set to the B_3 fingering. On the rosewood oboe this corresponds to all holes closed while on the Buffet Crampon oboe the hole in the bell joint remains open. The short vertical lines at the bottom of the graph indicate the harmonics of the frequency spectra of notes played on the two instruments.

Examination of the impedance curves reveals that the resonance peaks occur at lower frequencies for the rosewood oboe than for the Buffet Crampon oboe. That is, the sounding length of the rosewood oboe (the length of the instrument plus an end correction) is greater than the sounding length of the Buffet Crampon oboe (the length of the instrument reduced by an amount dependent on the dimensions of the open hole in the bell). It is therefore unsurprising that the harmonics of the played notes indicate that the playing frequency of the rosewood oboe (244 Hz) is 21 cents flatter than that of the Buffet Crampon oboe (247 Hz). This is consistent with the rosewood oboe being designed to play at 'low pitch'. On the equally tempered scale based on A_4 = 435 Hz, B_3 corresponds to a frequency of 244 Hz so it appears that the rosewood oboe does play at the intended pitch. Of course, the measurements were made at room temperature and warming up the instrument through playing would have the effect of raising the playing frequency. However, this could be easily countered by pulling the staple out a few millimetres.

Figure 5 shows impedance curves for the two oboes set to the C_5 fingering. Again, the short vertical lines at the bottom of the graph indicate the harmonics of played notes.

Examination of the impedance curves reveals that the resonance peak frequencies for the two instruments are very similar. Despite this, the harmonics of the played notes show that again the playing frequency of the rosewood oboe (530 Hz) is approximately 21 cents flatter than that of the Buffet Crampon oboe (536 Hz). On the equally tempered scale based on A_4 = 435 Hz, C_5 corresponds to a frequency of 517 Hz so, even after the effects of adjusting the staple and warming up the instrument are considered, the rosewood oboe might be expected to play slightly sharper than

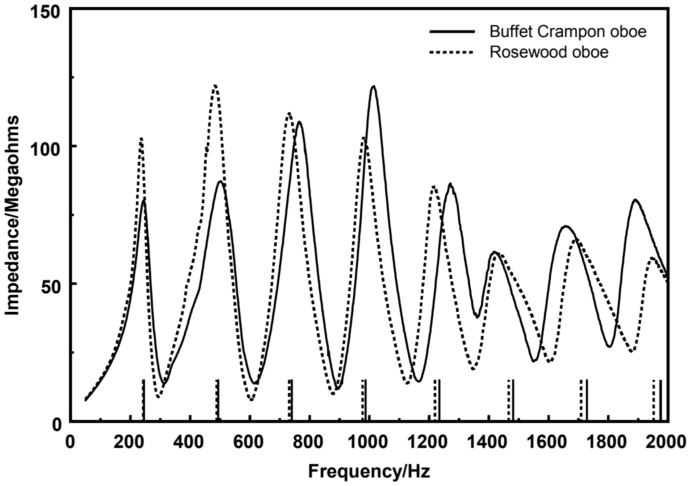

Figure 4: Input impedance curves and harmonics of played notes for B_3 fingering

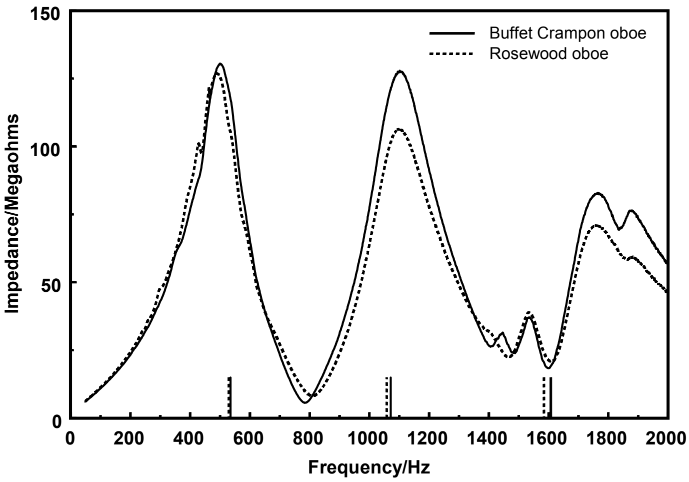

Figure 5: Input impedance curves and harmonics of played notes for C_5 fingering

intended. However, at C_5 the air column is short so a player can significantly alter the pitch of the note by embouchure adjustment and bring the instrument into tune.

Further examination of Figures 4 and 5 reveals that, for both B_3 and C_5, below 900 Hz the resonance peaks of the rosewood oboe are greater or equal in amplitude to those of the Buffet Crampon oboe. Above 900 Hz, however, it is the resonance peaks of the Buffet Crampon oboe that have the greater amplitude. From these observations, the rosewood oboe might be expected to have a "darker" timbre than the Buffet Crampon oboe. Playing the two instruments confirms this is the case.

CONCLUSIONS

The oboe donated to the Open University Acoustics Research Group displays keywork that implies that it was manufactured in the mid-19th century. The maker's marks reveal that the instrument was designed to play at 'low pitch'. Comparison of input impedance and sound spectra measurements carried out on this 19th century oboe with measurements made on a modern instrument confirms this difference in tuning and indicates that the 19th century instrument has a "darker" timbre.

REFERENCES

[1] Bate, P., *The Oboe,* Ernest Benn, London, 1956.

[2] Waterhouse, W., *The New Langwill Index: A dictionary of musical wind instrument makers and inventors*, Tony Bingham, London, 1993.