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Innovations of Theobald Boehm to the Flute Construction

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ABSTRACT

Theobald Boehm who had a long life full of creativity, tried to maintain his creativity and performing activities concurrently for almost sixty years in order to bring perfection to the construction of the flute. Two generation flutes that the German master invented in 1832 and 1847 had been one of the most important achievements in the development of the construction of the instrument until that date and those reforms had brought Boehm the reputation which he deserved. Beside from the reforms he made regarding the construction of the flute, Theobald Boehm also stands out with the musical pieces that he wrote for this instrument. In this study, formation process of the Boehm system flute which is still being used and the evolution of the flute during this process has been analyzed and it has been aimed to relay the importance of Theobald Boehm, who has made a great contribution for the flute to become a solo instrument instead of orchestral instrument and obtain status, in the history of the flute to today's flautists.

Key words: Boehm System, Construction of the Flute, Theobald Boehm, Transverse Flute.

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1.0 Introduction

Flute is one of the oldest instruments in history. *Transverse flute* and *Recorder* have been the most used versions of the flute. Transverse flute went to Europe through Byzantium Empire and first seen in

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Germany, therefore it is known as the *German flute* (Tatu, 2006: p. 5). The primitive version of this flute was in one piece and made of wood in the Middle Ages. It had a cylinder shape with two feet length, but the sound range was very limited (Toff, 1996: p. 42). The *Fife*, which is known as the *Swiss Flute* and resembles to the piccolo with its small appearance, has six holes without any keys, its sound range is two octaves (Aktüze, 2003: p. 208). The Fife was used to accompany military bands along with a small drum (Toff, 1996: p. 42).

1.01 Transverse Flute in the Baroque Period

One of the most commonly used wind instruments in the Baroque period was the transverse flute, the improvement of the transverse flute also coincides with this period. The French flute player, composer and instrument maker Jacques Martin Hotteterre (1674-1763) design the instrument in three pieces. Those pieces were; the top part where the mouth hole is, the middle part where the six finger holes are and the foot joint where the closed D \sharp key is (Toff, 1996: p. 44). The instrument, which had been designed without keys, got its first keys at that time.

Then the improvement that German flute player, composer and instrument maker Johann Joachim Quantz (1697-1773) made on the instrument had important effects on the development of the transverse flute. Quantz added another second foot joint key to the bottom of the instrument (Toff, 1996: p. 45) and produced different sized pieces for the main part. After that the German flute player, composer and instrument maker Johann George Tromlitz (1725-1805) added new keys, then in the next decade the German master Theobald Boehm made continuous improvement on the instrument, which set the base of the today's modern flute.

2.0 Theobald Boehm (1794-1881)

The improvement of the flute in the Romantic period is needless to say closely related with Theobald Boehm. Theobald Boehm, who was a flutist, flute maker, composer and an inventor, was born in 1794 in Munich. With his new ideas, he made constant experiments on the main body of the instrument and set the foundation of today's flute with his improvements (Maclagan, 2014). He aimed at making an instrument with mechanical and acoustic system that would enable it to have broader musical expression in terms of technical and musical functionality and to give the performers more room to express their talents.

Theobald Boehm had the curiosity for mechanisms and he learned about the basic mechanisms by analysing musical boxes. With the work he did in his father's jewellery workshop, he displayed his talent as a professional instrument maker in his early ages (Powell, 2002: p. 164). Theobald Boehm started his experiments to improve the body of the flute since his childhood. He got flute lessons from Johann Nepomuk Kapeller (1776–1825), who was a flutist at the Royal Bavarian Orchestra. Before commencing this education He had taught himself one keyed flute without any education before the lessons and he was already aware of the deficiencies of this flute from the first time he touched it. After that, with the guidance of his teacher Kapeller, he produced a replica of August Grenser's (1720-1807) four keyed flute (Powell, 2002: p. 164).

Boehm had an extraordinary curiosity, endless energy and assiduity, which made his lessons very productive with Kapeller. He was not only performing flute, but also working on the improvement of the main frame of the instrument with his teacher. In the meantime, Kapeller designed new flute prototypes and assigned Boehm to build them and add the mechanism since he was trained in the jewellery workshop (Powell, 2002: p. 164). In the following years, he did not only follow his teacher's ideas, but he also used his ideas and made several instruments. Boehm was very successful with his lessons, since Kapeller used all his creativity and pedagogic knowledge; he had to end the lessons with Boehm after two years (Bate & Böhm, 2001: p. 777).

With the knowledge he received from his teacher along with his talent, he applied to Isartor Theatre as a flute player, a newly opened place in Munich. On the same year he finished his lessons and worked for the theatre for five years. He also kept working on the flute and helped his father in the jewellery workshop (Bate & Böhm, 2001: p. 777). This intense period for 18 years of young Boehm was extraordinarily interesting and pleasant as he states later on.

In 1818, at the age of 24, he became a flutist at the Munich Palace Orchestra; he then stopped working at the jewellery workshop and concentrated on his performing career. He became a lead flutist in the orchestra between 1830 and 1848. Between 1821 and 1831 he put his signature under important success in Europe with his tours and proved himself as a performer (Bate & Böhm, 2001: p. 777). Some of the important places in Europe where he gave concerts were; Vienna, Prague, London, Paris, Venice, Strasburg, Bern, Lausanne, Berlin, Leipzig, Nurnberg and some cities in Germany, Austria and Switzerland. Through those tours he proved himself as a virtuoso and his performing skills became known not only in Germany, but also in Europe. With his fine tune and technical ability he was seen as the best German flutist of his time.

Apart from his excellent performing skills, he knew the capacity of the flute well. He wrote many pieces and often played them at his concerts. He wrote a concerto, many virtuoso pieces, fantasies and variations. He also transformed many pieces for flute and piano. His pieces became very popular in his lifetime but forgotten after his death. They were later reminded to the musical world by Marcel Moyse (1889-1984) and his students in the middle of the 20th century (Bate & Böhm, 2001: p. 777).

Despite his high performing abilities and methods, he was not happy with his instrument and looked for ways to develop it further. Flutes before Boehm's reforms were usually seven nine keyed, but those keys were not sufficient for quality sound, intonation and technical capabilities.

Also insufficient acoustics, unclear intonation in different registers and the lack of expression in nuance was among the deficiencies of the old instrument. Its conical structure was preventing improvements on the acoustic if it, the sound keys were also not placed correctly to produce the right acoustic.

Niccolò Paganini (1782-1840) and Franz Liszt (1811-1886), the virtuosos who carried the performing art of violin and piano to a higher level, have a major influence on Boehm's reforming ideas. He needed to make significant changes on the main frame of flute in order to improve technical capabilities of it and bring it closer to piano and violin (Toff, 1996).

The limited and weak sound of the flute and its unclear intonation were the usual problems that performer constantly had to face. Being one of those flutiest, Boehm had to spend more than 20 years to overcome the insufficiencies of the instrument. At the end of this long and hard work, flute reached a technical mechanism to perform well, a quality and strong sound and a clear intonation throughout its octaves.

Despite his intense schedule in the orchestra and his concert activities, he did not stop working in the tiring and wearing jewellery workshop and kept experimenting for a better flute structure. He also reached an agreement with two instrument makers from Munich. Boehm produced instruments for sale under their supervisions and received some payments from the sales. Working in the workshop gave him the experience and opportunities to experiment on the instrument. Also with the money he earned from jewellery workshop he had the opportunity to buy different make of flutes and was able to analyse, compare and identify their strength and weaknesses in details. At the end of these works, he became a master in instrument making.

2.01 Boehm's 1829 Model Flute

With the experience that he gathered by collecting and analysing different model of flutes in details, Boehm opened his workshop in 1828. But this workshop caused so many problems, one of the most

important them was the Royal Licence that he needed to operate. In order to obtain such a licence, one needed to have a technical education or a personal invention. Since Boehm did not have a technical education, in order to get the licence and the patent, he claimed in his petition that he constructed a successful model of a flute. In 1829, in his petition he stated the features of his invention, the eight keyed flute and its strength in comparison to others under six headings:

- 1) *Clear intonation*
- 2) *Balanced sound*
- 3) *Good performance on the high and low pitched sound*
- 4) *Simple and easy key mechanism to use*
- 5) *Good appearance*
- 6) *Excellent craftsmanship and a high quality* (Powell, 2002: p. 165).

With that petition, he obtained the licence and the patent for 10 years, which enabled him to carry on with his experiments on the flute without any problem. However, his eight keyed flute that he designed in 1828 was not sufficient in terms of the high and low pitched sound, intonation and its key structure. He was aware of those problems. In his book that he published about his work, the *Flute and Flute Playing*, he stated that he was working on the keys, springs and other mechanism to make the necessary changes and improvements in order to have an equal tone colour and clearest intonation possible. (Boehm, 1908: p. 3).

Boehm opened his workshop in 1829 and invited Rodolphe Greve (1806-1862), who was an experienced wooden wind instrument maker in Manheim, to help him. After Greve joined him in 1930, he was relieved and concentrated on his concerts. (Powell, 2002: p. 166). Boehm gave concerts in many places, which gave him the chance to analyse other type of flutes produced in those places and to listen other performers who played on those flutes. These experiences contributed a lot to the process of his work for the development of flute.

2.02 Boehm's 1831 Model Flute

The new flute that Boehm finished designing in 1831 was very advanced in terms of the key mechanism. Having round keys, it became the base for the flute that he completed in 1832. After listening English flutist Charles Nicholson in 1832, he intensified his work on the construction of the flute and made important improvements.

2.03 Boehm's 1832 Model Flute

Boehm equipped his 1832 model flute with standard open and round keys, which gave a clearer tune and intonation. He also added a stabilised sport device for the performer's left hand thumb in order to make the movements more comfortable. (Zakian, 2014). He then made the holes bigger, which not only helped to improve the mechanical and acoustical side of the instrument but also increased technical and musical expression of it substantially.

However, those improvements did not satisfy Boehm. Although the new flute was remarkably better than the old flutes, its sound did not balance between high and low pitch octaves well. Therefore, he had to keep working and experimenting on the instrument.

2.04 Boehm's 1847 Model Reform Flute

After his long and intense work with so many experiments on the construction of the flute, in 1846 he designed its conical body as cylinder, expanded the mouthpiece and changed the square mouthpiece to a round shape. This way he obtained stronger and clearer tone.

After acoustical calculations, he made the sound holes the same size, which enabled the performers to play technically challenging and fast passages in a comfortable way. After trying so many different metals, he finally decided to use silver for his design, which made the instrument lighter and enabled a better tone. The German master's reform flute got attention that it deserved from professional performers in England and France in a very short time. It also got recognised in the United States and its production started in 1851. His 1847 model reform flute got its first award from the Industrial Exhibition of All Nations that held in London in 1851 and was with a gold medal by the Paris Exhibition in 1855. After that he got another award from the General German Industrial Exhibition, which was a first award that he received from his country (Toff, 1996: p. 57).

3.0 Conclusion

Theobald Boehm's consistent attempts to gain new knowledge and his endless research made him physically active until the end of his life. His innovations and revolutionary ideas about mechanics, acoustics and performing art opened not only new horizons for flute, but also for other wooden wind instruments.

Although some minor changes have been made on the instrument after Boehm, his reform flute is close to excellence. However, like all the other wind instruments in general there are some deficiencies in the flute in terms of the finger techniques and intonation. Its intonation in the 3rd octave is not very clear; in terms of the finger techniques the trills made in the 3rd octave are challenging positions for performers. Those challenges can partly be overcome with the professionalism of a performer.

Boehm, the inventor of today's modern flute is needless to say one of the most important figures in the history of the flute. Despite his remarkable contribution to the flute, there are other figures that inspired him to build his reform flute. Especially the English flute virtuoso Charles Nicholson was one of those who inspired Boehm personally to improve the flute towards Excellency. Therefore, apart from the German master there are other virtuosos who have important contributions at the time which helped the development of the flute.

As a result, this work explains the innovation in the construction of the transverse flute between 1829 and 1847. It will also be a source for the future studies about the mechanical development of the flute, which will be categorised as “before the Boehm's reform flute” and “after the Boehm's reform flute”.

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