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# THE ROLE OF TONEWOOD SELECTION AND AGING IN INSTRUMENT “QUALITY” AS VIEWED BY VIOLIN MAKERS

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## Introduction

Resonance woods are the raw material used for the making of violin family: Norway spruce (*Picea abies*) is used for top plates and sycamore maple (*Acer pseudoplatanus*) is used for back plates [Bucur, 1992]. On the one hand, the mechanical/acoustical properties of these two preeminent wood for classical stringed musical instrument have been well studied. It is often recognized that high quality resonance spruce has low density, high modulus of elasticity, low damping and high anisotropy [Ono & Norimoto, 1983; Obataya et al. 2000]. When compared to “common quality” spruce wood, the resonance spruce shows atypical relationships between structural/visual features and mechanical/acoustical properties [Carlier et al, 2014]. On the other hand, physical acoustics and psychoacoustics studies were conducted on the behaviour of finished violins and the perception of their “quality” by players or listeners. However, while the link between the raw material and the finished instrument is made by luthiers, their practice and opinion has seldom been explored. According to the only psychosensory study on the subject [Buksnowitz, 2012], the selection of wood by violin makers would rather rely on visual criteria than on mechanical or acoustical properties that seem difficult to assess. It could also reveal the use of indirect indicators, and/or take into account personal or cultural preferences in wood choice [Brémaud 2012]. Empirical knowledge of luthiers is precious and can help us to appreciate the concept of “resonance wood”. Therefore the objective of this ongoing study is to improve the understanding of the interactions between physic-mechanical properties of resonance wood, their natural variability, and the actual expertise of violin makers in the selection, qualification and processing of their raw material. Here we will focus on a survey conducted on the way instrument makers choose their wood, and their opinion about issues of time and aging.

## Methods

To identify craftsmen’s opinions, practices, empirical knowledge and their main questions, a “socio-technical” survey on both qualitative and

quantitative grounds has been created. The survey was developed as face-to-face interviews using a modular and detailed questionnaire. It was design in order to be applied to different instrument making specialities and to be used on other project. As a first step the survey concerned the violin-family luthiers of Montpellier and then was extended to the rest of France. Suppliers were also questioned. In a second step an exploratory study was extended to Iranian makers of traditional string instruments. Quantitative analysis of the questionnaire was first conducted (using Sphinx software) while qualitative analysis of interviews’ recordings (managed under Sonal software) is still in progress, include opinions about the effect of playing.

## Results

Makers reckon they rely mainly on empirical processes (but also historical) for their practices. They consider resonance wood choice to be one of the most determining factors in sound quality of the instrument. Resonance wood choice and Design appears to be determining factors in both Sound quality and global quality of the instrument (figure 1). Lutherie’s work or varnish are considered more relevant to “global” than “acoustical” quality, while pre-stresses and adjustment are more related to “acoustical” notions.

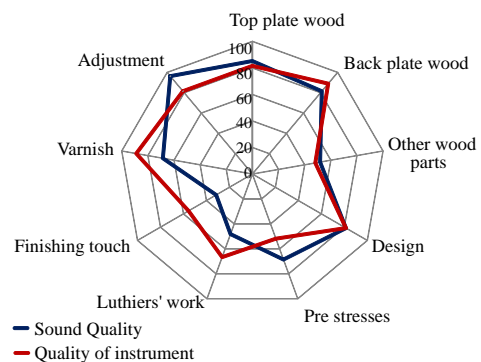


Figure 1: Importance scale of different fabrication parameters in sound quality and quality of instrument

Empirical qualification criteria taken into account by violin makers to choose spruce wood are mostly based, by order of importance, on cutting, density, percentage of latewood, growth ring uniformity and width. For maple, ring width seems to be the most

important criteria for luthiers. Density, cutting plan and drying are also very important. Unlike spruce, colour appears more crucial for maple.

Most of the makers do not take into account the drying time before buying their wood. However they recommend a drying time equal to or higher than at least two years, before starting the fabrication. More than half of luthiers do not specifically seek for aged wood, even if they believe that the properties of their raw material can be changed by aging. When asked the question of “evolution of acoustical properties through time”, they consider such an evolution would be different depending on the instruments being played or not. The opinion on the effect of aging on different criteria of the instrument wood is more contrasted over the centuries (very positive effect or no effect) than when considering short term aging (Figure 2). For aging over centuries, there is a consensus about a positive effect on visual criteria, while there is weaker agreement about acoustical effects, and physical/mechanical properties are not thought to be much changed. For short-term aging (years or few decades), luthiers think that it more consistently affect the different considered properties, although with smaller maximum importance. Acoustic properties (followed by physical/mechanical ones) are more thought to “improve” over years/decades than over centuries.

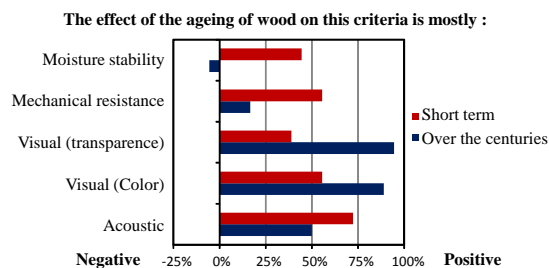


Figure 2: Importance scale of the effect (positive or negative) of wood aging on different criteria

Luthiers report a lot of interest in scientific approach of musical instruments, especially regarding resonance wood. They show different “profiles” of interests for research in various fields (historical, forest, material, acoustical or sensory aspects) and these different “profiles” might reveal some kind of “school of thinking”. Most of them would be interested in the development of simple tools usable in a workshop if they permit a better knowledge of the wood.

The perceptual criteria used for wood qualification can be visual, physic-mechanical, auditory and will require a more detailed study to evaluate the respective contribution of these different fields of perception.

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## References

- V. Bucur, “Les bois de lutherie ». Journal de physique IV, 2: 59–65, 1992
- C. Carlier, I. Brémaud, J.Gril, “Violin making ”tonewood”: comparing makers’ empirical expertise with wood structural/visual and acoustical properties”. ISMA, 325–330, 2014
- T. Ono, M. Norimoto, “Study on Young’s Modulus and Internal Friction of Wood in Relation to the Evaluation of Wood for Musical Instruments”. Japanese Journal of Applied Physics, 22(4) : 611–614, 1983
- C. Buksnowitz, R. Evans, U. Müller, and al. “Indented rings (hazel growth) of Norway spruce reduce anisotropy of mechanical properties”. Wood Sciences and Technology, 46(6) : 1239-1246, 2012
- + Obataya et al 2000 « Vibrational properties of wood in longitudinal direction »
- + Brémaud 2012 JASA?