Non-Occidental Lutes: Relationship between Making Process and Functionality

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ABSTRACT

The Musée du Quai Branly and the Musée de la musique both in Paris keep in their collections more than 300 non-occidental lutes coming from Africa (Ud, Ginbri, Kwitra can be given as examples), Asia (Setar, Sarod, Ektara, Biwa, Yueqin etc.) and South Africa (Chiaapas, Charango etc.). From the organological classification [Grove] these instruments present some common characteristics (without taking into account the sound): chordophones in which a string bearer and a resonator are united and cannot be separated, and in which the strings runs parallel with the soundboard. However do they have acoustical common characteristics? Trying to answer this question a large study has been led on more than one hundred instruments. In most cases, because these instruments are kept in museums they are not played anymore. Moreover they are not always in a good state (cracks on the soundboard and soundbox, missing parts), so a methodology has to be applied on every instrument independently on their conservation state and not too much time consuming, regarding the number of instruments to be analysed. The methodology consists in measuring systematically the geometry of some elements of this wide corpus (soundboard and soundbox dimensions, neck dimensions, vibrating length, rosacea dimensions when it exists). In addition to these measurements, vibrational parameters are acquired using an impact testing method. The accelerometer, measuring the vertical acceleration, is fixed close to the treble foot of the bridge, while impacts are applied on 9 different points on the soundboard. Then the accelerometer is fixed on the neck and the neck is impacted in 2 more points. For each instrument, the dimensions of the soundbox are compared to the maximum string vibrating length. Generally, in string instruments, some body resonances, resulting from the coupling between structure and air vibration in the soundbox, amplify the radiated sound. Thus, in order to investigate the acoustics of the lutes, the lowest resonance, called Helmholtz frequency, is measured, thanks to a microphone positioned very close to the hole and recording the hammer impact. So, from the vibrating measurements the frequencies of the two largest inertance peaks match those of the sound spectrum. It is then possible to show some correlation and some common characteristics between geometrical and vibrating measurements.