WHAT CONTRIBUTION CAN ACOUSTICS MAKE TO ORGANOLOGY?

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1 ABSTRACT

In this paper I illustrate some of the problems that occur when trying to use Acoustics and Vibration to further the study musical instruments, but also some of the unique insights that it can give. The objectives of Musicians, Luthiers, Organologists and Acousticians in studying musical instruments are very different and this can give rise to misunderstandings. Luthiers are concerned with the subtlest of changes and take the overall sound generation mechanism for granted. This means that they sometimes miss potentially disruptive innovations. Acousticians tend to look at the big picture before the fine detail and sometimes overlook key and characteristic features. Musicians have another perspective, heavily influenced by their perception not only of how an instrument sounds but how it should sound. Organologists and Ethnomusicologists are interested in the circumstances behind an instrument's production, the history of the instrument, what it meant to the people of the time and so on.

Analysing the musical sound of an instrument is valuable and relevant, but it is also highly subjective. It is very difficult to isolate differences in construction and to link them to differences in sound. Investigating the history and social circumstances behind an instrument is also important, but it is difficult to link to the design of the instrument itself. An acoustic analysis is a way of connecting all of these facets of study. I have conducted such an analysis on the Bolivian Charango, a small plucked stringed instrument from the Andes region of Bolivia and Peru. I used the results of the acoustic analysis to explain the construction by linking the musical sound to the Ethnomusicology; something that would not have been possible without this data. It is a good example of the contribution that Acoustics and Vibration can make to Organology.

2 INTRODUCTION

This is not an academic paper, presenting the results of new experiments. Instead it is intended to provoke thought about how we study musical instruments as acousticians by putting our researches into context. It is a result of my own experiences as an amateur researcher, musician, luthier and organologist, seeing firsthand the markedly different objectives in each discipline.

The following are my own views, but I would be interested to hear from anyone else interested in this thought process. If you are interested then please post on the IoA Musical Acoustics Group LinkedIn page or contribute a letter or article to the group newsletter *MAG MAG*, published quarterly.

I am grateful to Professor Jim Woodhouse, who supervised me on the Charango research.

3 SOUND OBJECTIVES

3.1 What do luthiers want to know?

A luthier, or musical instrument maker, is concerned with the question "What makes one instrument sound different from another?" (for example "Why do different guitars sound different?"). Luthiers tend not to be interested in radical changes to the design of their instrument, because they are catering for a particular group of people who already have set preferences. Their focus is on refining

the sound of their instrument, rather than creating something new. This means that luthiers tend not to look at the big picture.

Making instruments is a notoriously risky profession and so any maker has to be quite careful with how far they push the boat out experimentally. They are making instruments to sell and for that to be the case, they have to appeal to as wide a range of customers as possible. The disadvantage with this is that most instruments end up in a developmental local maximum – where an existing design is refined and refined, despite inherent drawbacks. Many instruments today have remained substantially unchanged for hundreds of years.

3.2 What do musicians want from an instrument?

Musicians have very particular requirements when considering a new instrument. They have a reputation for being conservative – perhaps understandably, because they have in many cases spent their entire life coaxing the best sound that they possibly can out of a very specific instrument. Musicians often tend not to be interested in radically different sounds, because that is not what pays the bills. What pays the bills is a lovely sounding guitar, not a wacky new instrument that bookers can't identify with.

In addition to the sound, musicians will incorporate other factors into how they perceive an instrument. For instance, how easy or pleasant the instrument is to play (the 'playability') will affect a musician's performance and therefore their liking for the instrument. The perceived quality of an instrument also has a bearing on the sound, since musicians tend to play better on instruments that they think are of higher quality. Moreover, listeners perceive music in a more favorable light if they believe that the performer is of an exceptional standard or is playing on an exceptional instrument!

3.3 What questions do Acousticians ask?

A common question which Acoustics researchers ask is (for example) "Why does a guitar sound like a guitar?". The problem with this approach is that they could miss all that is of interest to the luthier, however the advantage is that they have the potential to provoke disruptive innovation. With the understanding of how an instrument works comes the knowledge of how to change it in specific ways, but in order to appeal to musicians and luthiers extreme care must be taken. There is the temptation to ignore the fine detail in establishing the basic sound generation mechanism – but this fine detail may be the difference between an adequate instrument and a superb one.

3.4 What other questions can we ask?

There are fertile areas for research in the way that instruments reflect the social and cultural circumstances of their origin and how their development mirrors the development of the society. This could be anything from the development of louder violins to cater for the demand of the violin as a solo instrument or the resurgence in popularity of the harp due to its suitability for playing in the drawing room. Musical instruments play an important in the history of a society and they are a striking reminder of the continued ingenuity of humankind. Organology and Ethnomusicology ask these questions and more.

4 HOW CAN ACOUSTIC ANALYSES CONTRIBUTE?

Acoustic Analysis has the potential to contribute to any angle of Musical Instrument research, as long as it is put into context. It can satisfy the scientist's curiosity, the luthier's professional interest or the musician's desire. It can also give real data in an ethnographic study. Acoustic research is quantifiable, so it is a more appropriate way of assessing the sound of a particular instrument than perception (although the science of perception is a fascinating research area in its own right).

The value of acoustic research into Musical Instruments is that it can tie all these disparate threads mentioned above together. For example, a piece of acoustical research may identify a sound quality of an instrument which specifically appeals to musicians. It might be able to link that to a specific construction detail, enabling luthiers to be able to build better instruments.

As a further example I present some research I did a few years ago into the acoustics of the Bolivian Charango (to be published in the *Galpin Society Journal* 2015).

I tested five Charangos, a Ukulele, and a Timple and compared the results to each other and to that of a classical guitar. I found distinct similarities in the Bridge Admittances for the Charangos and distinct differences between the Charangos and the other instruments tested. This gave me the conclusion that it was meaningful to talk about the Charango as a distinct instrument.

Further to this conclusion however, I was able to match certain acoustic characteristics of the instruments to specific construction details. I looked at Charangos from both rural and urban environments and showed how and why the latter developed out of the former. Without this acoustic analysis this insight into the evolution and development of the instrument would not have been possible.

5 CONCLUSIONS

There have been many instances of acoustic research benefiting the musical and ethnomusicological community; however there is the potential for much, much more. With care, acoustic research has the unique power of being able to provide a crucial link between all aspects of an instrument's sound, construction, usage, design and background.