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SUBJECT: The Hang Musical Instrument

My name is Dr. Anthony Achong and I am former Senior Lecturer and former Head of Department at the Department of Physics, University of the West Indies. I have been studying the sound of metal sheets and shells all my life and have done extensive research in this field, especially in relation to steelpan. I have published extensively in research journals in a number of areas of Physics and Mathematics with some 25 papers on the steelpan. After decades of research, I published my book "Secrets of the Steelpan - Unlocking the Secrets of the Science, Technology, Tuning and Operation of the Steelpan" in 2013.

Against the background of the Hang's basic shape of two joint bowls, I was asked to comment as an expert to the question, if two different percussion instruments (idiophone class, in the category shells), even if showing different geometric shapes, could provide similar sound features.

I know the Hang as an instrument because of my research and experiments since the year 2000, when it was presented at the International Conference on Science and Technology of the Steelpan, Port-of-Spain, Trinidad and Tobago.

As well as steelpan, the Hang creates sounds by vibrations of a fixed resonance body that include note shapes. The Hang does not differ in this respect from traditional steelpan and received a lot of recognition in the steelpan scene because of its distinctive and original design. The main difference is that it is played with impacts made with the bare fingers as opposed to the rubber tipped sticks used on the steelpan.



One of the most important factors for producing good sound is the material used to form a steelpan or the Hang. My studies showed that shallow metal shells compressed by hammer blows lead to the best results. Besides the raw material, there are more than 30 different parameters that have an influence on the specific sound of such instruments.

The outer shape of a resonance body is of minor importance to the specific sound of such instrument. In case of a Steelpan or the Hang, the basic technical requirement for creating the desired sound is the clamping of the shell. In contrast to freely oscillating instruments such as the cymbal, the Steelpan and Hang oscillate for a shorter period of time.

The first Steelpans were made of oil barrels turned upside down with the bottom of the barrel indented like a bowl. However, the same sound could be achieved by bending the bottom outwards.

Equally, for the Hang the main element from which the desired sound is produced is the clamped upper bowl. The lower bowl has no significant influence to the sound and it is not essential for the sound that the upper bowl is bent outwards. It could produce the same sound when using the upper bowl facing downwards.

Also, the specific shape of that bowl has no influence on the specific sound, which is produced by the True Notes. Consequently, the whole instrument could show basically any form as far as the bowl is clamped by a fixing frame.

The sound of steelpans as well as of the Hang is mainly produced by the vibration of the True Notes that are embedded and compressed in a clamped Pan or Hang face.

The specific position of a properly blocked True Note has no relevant influence to its sound. When looking at the Hang, the note shapes could be placed anywhere on the upper bowl or even on the lower bowl with no difference to the sound that they create. This applies also specifically for the note (called Ding) on the center top of the Hang. The Ding could equally be placed anywhere on the Hang and it is neither essential that the lateral notes are placed in a circular line around the bowl.

Traditional notes are often shaped spherical or ellipsoidal. But in fact, there is an infinite assortment of shapes that the tuner or pan maker can give to the note. Crucial for good sound are compressive stresses in the note, which the tuner affect primarily by adjusting the compression of the material used.

No two manually produced notes are exactly alike in tone. Stamping out notes to precisely the same shape with a specially shaped die in a press-forming process, only determines the shape of the traditional note. So it is not necessary or important to produce notes with the same shape anyway.

Thus it would be possible that two similar looking note shapes produce totally different sounds or that two different looking note shapes produce similar sounds.



As a result, I already concluded in my book that something that looks like a pan is not necessarily a pan. I call such look-alike pans "dummies" and would refer this term specifically to industrially reproduced pans that only reproduce the outer shape of a steelpan or the Hang. Such "dummies" do not possess the required increased stiffness on the notes nor the necessary stress distributions relative to the notes.

It is thus physically impossible that a steelpan that is industrially reproduced by copying the outer shape of a steelpan or of the Hang sounds the same way like a hand tuned instrument.

As outlined above, this also means that the outer shape of the Hang is not essential for the sound that it creates. Similar sound could be produced by a randomly shaped idiophone of the category shells. The specific sound depends most importantly on the tuned note shapes, which alike could be designed by any random outer form and irrespective of its position on the instrument.

Thus I conclude that the specific shape of the Hang with two joint bowls and the circular positioned notes shapes and a center note shape on the top have been chosen by the designers primarily because of aesthetic reasons.



Dr. Anthony Achong