From a Luthier's Notes:

Some Thoughts on Elevated Neck Guitars

by Sebastian Stenzel

In the history of the classical guitar there have been many attempts to improve its construction. Some have been accepted by the players, some have not. One idea was to elevate the neck in combination with a negative neck angle. This idea is not new: there is, for example, a guitar from 1832 by Bernard Enzensberger, Vienna[1], or one by C.F. Martin from the 1890s[2], and probably many more, showing this feature. However, the idea really gained traction with the version made by Thomas Humphrey, who called it his Millennium model. He said the idea came to him in a dream.
Thomas Humphrey (1948 - 2008) was a guitar maker from New York and his development of the Millennium model around 1985 had a great impact on guitar making, as this model was played for some years by many well known players like Eliot Fisk, Sharon Isbin, David Tanenbaum, Carlos Barbosa-Lima, the Assad brothers, and many others.

Was this change in construction an advancement? In my opinion it is not, even though the "*incredible access to the upper register*", to use Humphrey's own words, is undebatable. But as I see it, the negative neck angle is going against the main improvements Torres had introduced, namely the doming of the soundboard in combination with a bracing glued under tension[3]. Let me explain why I think this negative neck angle is not a good idea by first taking a look back on the historical development of fingerboards. Here is an excerpt from a paper I wrote about 20 years ago on differences in Spanish guitar making schools:

One difference between the Madrid and the Granada schools, which I find very significant, lies in the construction of the neck angle.

Until the beginning of the 19th century, guitars generally had no fingerboard, and if they did, this was only to protect the surface of the neck and it was in one plane with the soundboard. This way of construction has two small advantages and one serious disadvantage. The first advantage is - obviously - that no fingerboard is needed, the second is that

---

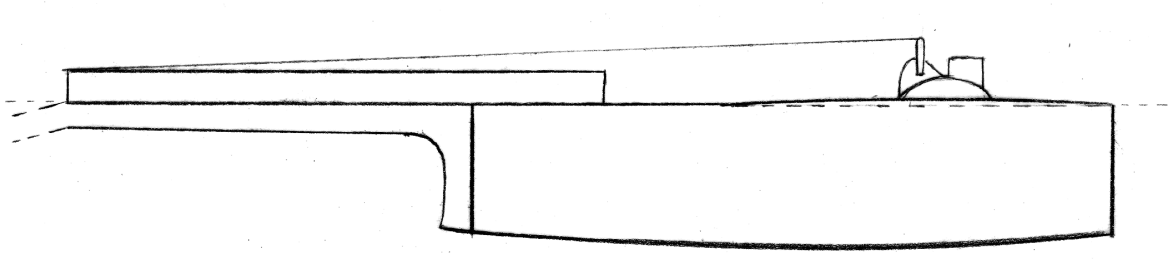
1 At the Historisches Museum Basel - Musikmuseum

2 Shown in Tony Bacon "History of the American Guitar: 1833 to the Present Day

3 Both features were done before by other makers, but Torres was – to the best of my knowledge – the first to combine them.

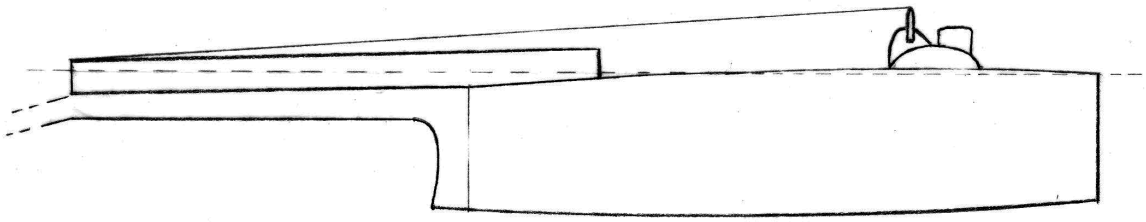
the force factor of the pull of the strings, which exerts downward pressure on the bridge, is the greatest. (It will become clear why I think this is advantageous in a moment.) The disadvantage is that eventually necessary repairs, due to a deformation of the neck or neck angle, for example, can only be done by removing material from the neck, which means changing its thickness, or by removing and resetting the neck — a very involved repair.

This disadvantage disappeared with the advent of the new technique of gluing a fingerboard on top of neck and soundboard of guitars sometime around 1830. In addition, the playability of the guitar in higher positions over the soundboard improved considerably. The neck was also made stiffer by the relatively large surface area of the glue joint between fingerboard and neck, which is good both for acoustic reasons and for the longevity of the guitar. It is no wonder that this new technique rapidly found favour among guitar makers and players alike. This first type of fingerboard was simply a straight board of even thickness glued to the surface of the neck, which was exactly in the same plane with the edge of the soundboard. The raised fingerboard level necessitated a higher bridge, which - together with some other construction changes in guitar making in the 19th century - facilitated the forming of a new playing technique. (Or the other way round?) Until today, this construction is characteristic of the Granada school of guitar making.



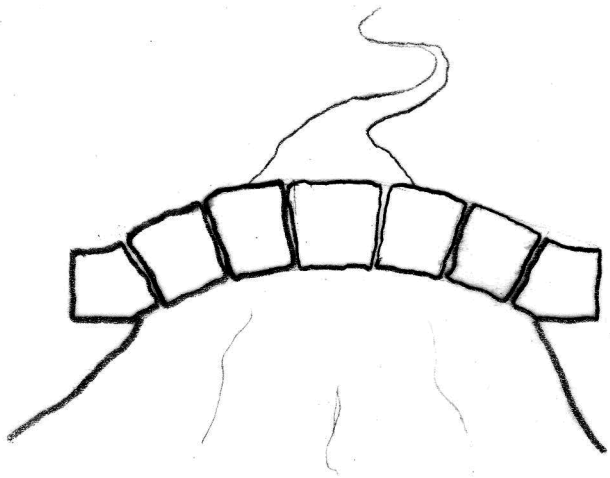
Construction of the neck angle as common in Granada – exaggerated for clarity

Further changes followed at the turn of the 20th century in Madrid. I have not been able to establish who first set the neck backward by bending the upper area of the soundboard back by about two degrees. In order to compensate for the resulting higher action, the neck was also angled back slightly. This meant that the surfaces of the neck and the soundboard were no longer in the same plane and the part of the fingerboard over the soundboard becomes wedge-shaped. This construction can be found in almost all guitars of the Madrid school.



Construction of the neck angle as common in Madrid – exaggerated for clarity

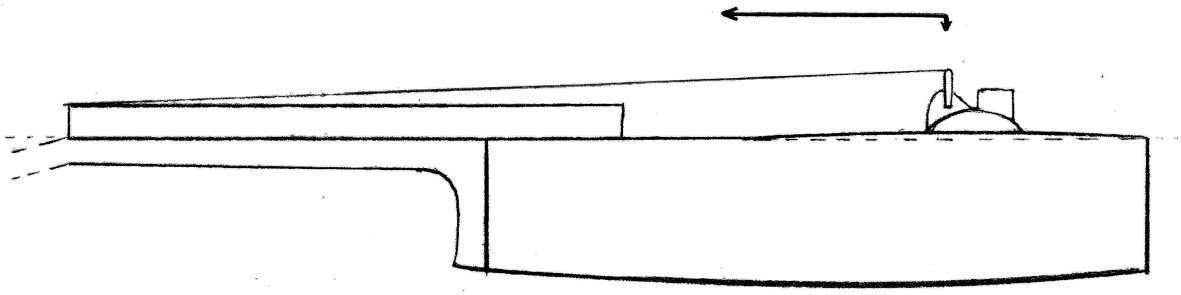
But why were the Madrilenian guitar makers making things so much more difficult for themselves? I would like to offer the following explanation: It is all about the angle of the strings to the soundboard. One disadvantage that arose with the fingerboard glued to the neck could not only be compensated by the tilted soundboard and the angled neck, but the overall distribution of the load imparted through the string tension was even improved[4]. This needs some elaboration: The concept of doming the soundboard by glueing the bars under tension as realised by Torres improved the statics of the soundboard so that it could be worked thinner, resulting in increased efficiency in sound radiation and greater sonority. The structural concept of a dome can be elucidated using a picture of a stone bridge.



The bridge is only stable as long as there is a force acting downwards(in this case gravity). If this force was exerted upwards in the opposite direction, the bridge would collapse. If we transfer this concept to the doming of a guitar

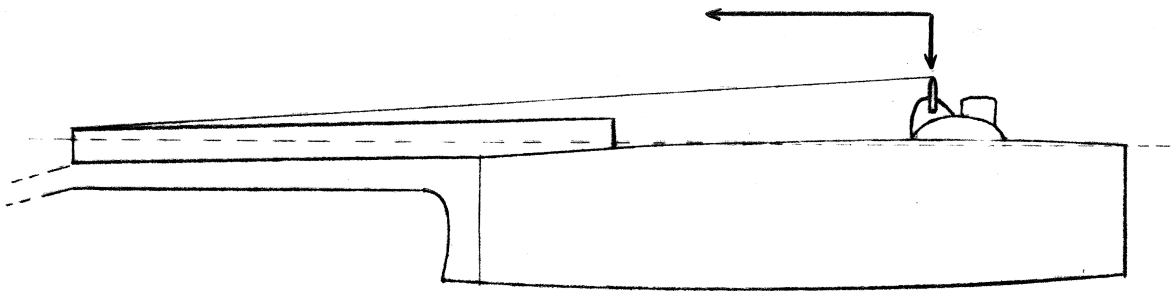
4 This line of thought shall not be pursued any further here, it would go far beyond the scope of this article.

soundboard, we see that the static stability of the soundboard increases[5], when a force perpendicular to the soundboard exerts downward pressure onto the bridge, and it decreases when a force pulls the bridge up, i.e., in the opposite direction. To illustrate the different directional factors of a force acting on a structure, it is common to split up the original force vector in a so-called parallelogram of forces into partial forces, where arrows show the direction of the partial force and the arrow's length shows the quantity of the force. With the construction of the Granada school, the main portion of the original string force is obviously exerted in the plane parallel with the edge of the soundboard, whereas perpendicular to this plane there is only a tiny force pressing the bridge down.[6]



Disregarding the deformation of the soundboard through string tension, the plane of the string and the tangent plane of the soundboard are almost parallel.

This perpendicular component of the string force is increased many times over by the changes developed by the Madrid school, which is, I am convinced, the purpose of this new method. Whether the inventors were motivated by any such considerations, or developed it intuitively, through trial and error, or common sense, makes no difference.



In this drawing one can clearly see that the string plane is not parallel to the tangent plane of the soundboard, but angled slightly towards it.

5 within a certain margin, of course

6 These deliberations are of course merely qualitative.

It could be argued that another possible reason for the angled neck introduced by the Madrid school has to do with aesthetics. At the beginning of the 20th century, Torres' method of doming the soundboard was taken to the extreme[7], especially in the tablao guitars popular at that time. Built in the style of the Granada school, these guitars often developed unsightly hollows where the arched area of the top transitions into the flat area of the upper bout. As we can see in many instruments, some builders tried different heights in arching the transverse bar under the sound hole, resulting in a expansion of the domed area into the upper bout. With the upper part of the soundboard tilted back and a slightly arched transverse bar, these hollows were largely eliminated and the doming visually more harmonious. Even if this seems to be just an aesthetic consideration, also a strengthening of the static can achieved by arching the transverse bar under the sound hole by changing the shape of the dome from spherical to egg-shaped. Some guitars by Daniel Friederich from the late 1960s and early 1970s took this even further with a cylindrical arch, i.e., the arch continues all the way to the neck joint.

If my deliberations about the neck angle are correct, it appears that the neck angle of the Madrid school is an evolution beyond that of Torres and the Granada school. To avoid any misunderstandings, however, I would like to make clear that I do not wish to assign any hierarchical value to one school over the other. Rather, I see the guitar as if it was a living species and I simply fascinated by the different branches of its evolution.

So far the excerpt.

In the February edition of 1996, Humphrey told the Acoustic Guitar Magazine that "*by sloping the soundboard and using a high neck angle on the Millennium, an entirely different load is created on the soundboard, producing greater power.*" I perfectly agree on the different load, but as shown above, I believe it to work in the wrong direction. And frankly, I could not notice greater power in the Humphrey Millennium guitars I have seen, played and repaired myself, including those played by Sergio and Odair Assad in 1997. In fact, Humphrey's construction required a much sturdier soundboard to compensate the negative effect of the "entirely different load", which he achieved by a relatively thick soundboard itself and a substantial lattice bracing, adding both mass and

[7] I remember a Manuel Ramirez 1912 guitar I restored with a doming of nearly 6 mm!

stiffness which certainly did not increase the efficiency of the soundboard.[8]

There are two other arguments against the elevated neck construction:
One is that the main path of energy transfer from the string to the soundboard, which is a torsion of the bridge around its lengths axis, is reduced in favour of a motion perpendicular to the soundboard, strongly activating the first mode of the soundboard. This, in my opinion, is the main reason why such guitars tend to have a sort of boomy attack.
The other reason is that the more the string is pulling the soundboard up, the greater the danger of resonances with longitudinal waves in the strings, which, if they appear, are usually completely out of the spectrum of harmonics and can create havoc among the "normal", transverse waves of the string. This is well known problem with harps[9], and I have seen it in elevated neck guitars in some cases.

Since the late 1980s, many guitar makers have copied Humphrey's design in different versions. But probably because of the disadvantages described above, today's versions are executed mostly in a more moderate way, with about half the elevation. This seems for many to be an acceptable compromise to keep the advantage of better accessibility of the high register[10], while mitigating the above mentioned problems. A much better solution, in my opinion, was shown by guitar maker Friederike Linscheid from Berlin, as a combination of a traditional architecture of the guitar with an elevated neck: the soundboard is sloped down only on the treble side, giving the desired better accessibility without any need for a different neck angle and therefore avoiding the related problems altogether. A horizontal cut away, as it were.

In an obituary to Humphrey's untimely death in 2008 (a great loss for guitar making, he was only 59) it says "*To many, Humphrey's renowned creation, the Millennium guitar, represented the most significant technical and philosophical advancement in classical guitars since the work of Antonio Torres in the mid-19th century.*"
It must have become clear to the reader that I don't think so. However, I see a possibility to maybe truly create this said advancement:

---

8 In Humphrey's patent #4873909 filed Dec. 8, 1987, I find quite a number of unsubstantiated claims about his Millennium model, but it would go beyond the scope of this article to analyse those.

9 Humphrey saw the harp as the most accomplished of plucked instruments, because they could play with an orchestra.

10 A cut away, the obvious alternative, has never been accepted by the majority of classical guitar players.

In 2022, I invented a new soundboard construction for elevated neck guitars, which turns the “entirely different load”, i.e., the force factor of the string pulling the soundboard up, into a positive asset, actually increasing the benefits of Torres’ development. I named it Inverted Dome Guitar, short: ID guitar. With this new construction, the stability of the doming is reinforced, allowing for a still lighter construction, truly resulting in increased efficiency of the soundboard, greater volume and greater modulation capacity, while maintaining the timbre of the traditional guitar.

On Feb. 1st 2024 I put strings on the first prototype of the ID guitar with this new soundboard construction. It will be presented shortly.