Size Matters: Historical String Length and the Probable Tunings of the Chitarrone or Theorbo

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The early music movement saw the revival of many instruments, one of which is the chitarrone, or theorbo. Although there has been confusion in the last century over the broadness and exclusiveness of the term “theorbo”, we now have a consensus that the theorbo is an instrument defined by its re-entrant tuning of the first or first two courses as well as a neck extension and a second pegbox that holds the long diapasons. The definition of the chitarrone is more exclusive. According to Piccinini, in order to qualify as a chitarrone, it is necessary to have the first two course in re-entrant tuning, while the addition of the second neck and pegbox is not its defining feature. [1]

Over the past few decades, these plucked instruments have become an integral part of the baroque continuo group, appearing solo, in pairs, or even triplets, as suggested by composers such as Monteverdi[2]. While it is satisfying to see continuo bands regaining their historical forms, the use of chitarrone/theorbo still leaves much to be desired. It is interesting how harpsichordists, violists da gamba, baroque flautists, recorder players, among many others want to use chronologically and geographically accurate instruments for each style of music, theorbists don’t seem to care too much. Too often I see an ensemble outfitted with regal, lirone and other assorted early continuo instruments, while the theorbo looks and sounds dubious at best. In most cases they are either instruments built after historical models, but shrunk by a significant percentage, or instruments of original historical size but strung completely differently from historical examples, to fit a need of most modern day lutenists- the comfort and facility of the left hand. While the quick passages surely sound dazzling, the sound from high tension nylon or carbon strings as well as copper wound diapasons on these too-small instruments resemble almost nothing of their historical counterparts. In this study, I will be taking a deeper look at the

[1] Alessandro Piccinini, "Intavolatura di Liuto et di Chitarrone, Libro Primo (Bologna: Gio. Paolo Moscatelli, 1623)

[2] Claudio Monteverdi, “L’Orfeo”, Venice, 1609

historical sizes of chitarroni, and the most probable stringing for these instruments, and compare the sound of variously sized instruments.

The origins of the chitarrone

At the end of the 16th century, a new member of the lute family emerged- the chitarrone. Piccinini[3] in 1623 wrote that the chitarrone was adapted from bass lutes, with strings raised in pitch, and that Caccini used such an instrument to accompany his own singing before 1594. Interestingly, contrary to the modern conception of the chitarrone, Piccinini did not mention the long neck and the second pegbox, which first appeared in 1594 with the invention of the archlute by Piccinini himself. The distinct characteristic that defines a chitarrone is thus the lowering of the first two courses down one octave, or the re-entrant tuning. As Piccinini wrote in Intavolatura di Liuto et di Chitarrone, Libro Primo in 1623:

"Many years ago in Bologna there were made lutes of very excellent quality, either in a long form similar to a pear, or with wide staves [i.e.ribs], so that one lute would play sweetly, the other sonorously. Suffice it to say that they were highly esteemed for their quality, particularly by the French, who came to Bologna expressly to take them back to France, paying any price that was asked, so that now few are found. In addition, very large lutes, much appreciated in Bologna, were made, to play passamezzos, arias and similar pieces in ensemble together with other, small lutes. The quality of these large lutes revealed itself all the more when the tuning was raised to a point where the first string, unable to be tuned so high, was replaced with another, thick string tuned an octave lower. This succeeded with such good effect that it is still done today. After some time, when il bel cantare began to flourish, it seemed to these virtuosi that these large lutes, being so sweet, would be very appropriate for accompanying a singer. But finding them tuned much too low for

[3] Alessandro Piccinini, "Intavolatura di Liuto et di Chitarrone, Libro Primo. Piccinini's introduction contains the history of the chitarrone. Piccinini is one of the three most prominent composers for the chitarrone or theorbo, the other two being Kapsberger and Robert de Visee. Piccinini claims to be the inventor of the extended second neck on lute-family instruments.

their needs, they had to furnish them with thinner strings and tune them up to a pitch comfortable for the voice. Since the second [strings] could not be tuned so high, they were tuned down an octave just like the first. Thus they accomplished their aim, and this was the origin of the tiorba, or chitarrone. A little while before I had the extension made for the contrabasses, there came to Ferrara Signor Giulio Caccini, called II Romano, an excellent practitioner of bel cantare, sent for by their serene highnesses [Alfonso and Margherita d'Este]. He had an ivory chitarrone arranged in the same manner as I have described above, which served to accompany his voice. Except for the purpose of [accompanying] singing, nobody played the chitarrone. But when I had the extension made for the contrabasses, many virtuosi, taking a liking to this harmonious and convenient variety of strings, began to find a way (in spite of the imperfection produced by the tuning down an octave of the first and second courses) of giving pleasure with solo playing as well. After that, some people began to practice in this way [solo], and thus the chitarrone began to be popular."[4]

One can see that according to Piccinini, such a peculiar tuning was not the intended product of instrument design, but rather a compromise one had to make, since thin treble strings could not endure the added tension by tuning the instrument up a fourth or fifth. Therefore one could arrive at the conclusion that these instruments must be over a certain string length where even the second course (D or E) had to be brought down an octave to avoid string breakage.

Since Piccinini mentioned the early chitarroni being converted from bass lutes, we must take a look at the sizes of bass lutes. Instruments that we put under the name “bass lute” nowadays have varying string lengths, from a meager 70cm to a monstrous 100cm. There is no reason to believe they all used the same tuning[5]. As Piccinini suggested, the tuning up of these very large lutes occurred not once, but

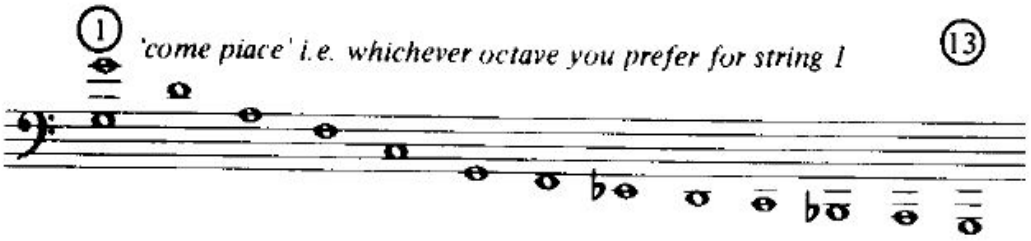
[4] Smith, Douglas Alton. "On the Origin of the Chitarrone." Journal of the American Musicological Society 32, no. 3 (1979): 440-62. Accessed October 23, 2020.

[5] The standard cello has a string length of 69cm, while double basses are at 105-110cm. While the disparity among bass lutes isn’t quite as large, it is very improbable that they used the same tuning, or even tunings that are only one or two whole steps away.

twice. Using Lauri Niskanen's lute string calculator[6], one can see that with a 76-78cm bass lute, a lute that is normally tuned in D, raising the strings a fourth higher would result in the first string to be too thin, hence necessitating the re-entrant tuning of the first course; the second course, however, is a comfortable 0.42mm in diameter, a gauge often used for the chanterelle of a tenor lute. I imagine it would take a larger lute for the re-entrant tuning of the second course to be necessary, as documented by Piccinini. But how large,exactly? We will conduct an experiment in the next chapters.

☑ String	☐ Length	☑ Note	☐ Tension	☐ Gut	☑ Nylgut	☐ Nylon	☐ Carbon	☑ Notes
1	78cm	g' + -	3.8 kg	0.33	too thin	0.38	0.28	
2	78cm	d' + -	3.2 kg	0.41	42 NNG	0.46	0.35	
2		d' + -	3.2 kg	0.41	42 NNG	0.46	0.35	

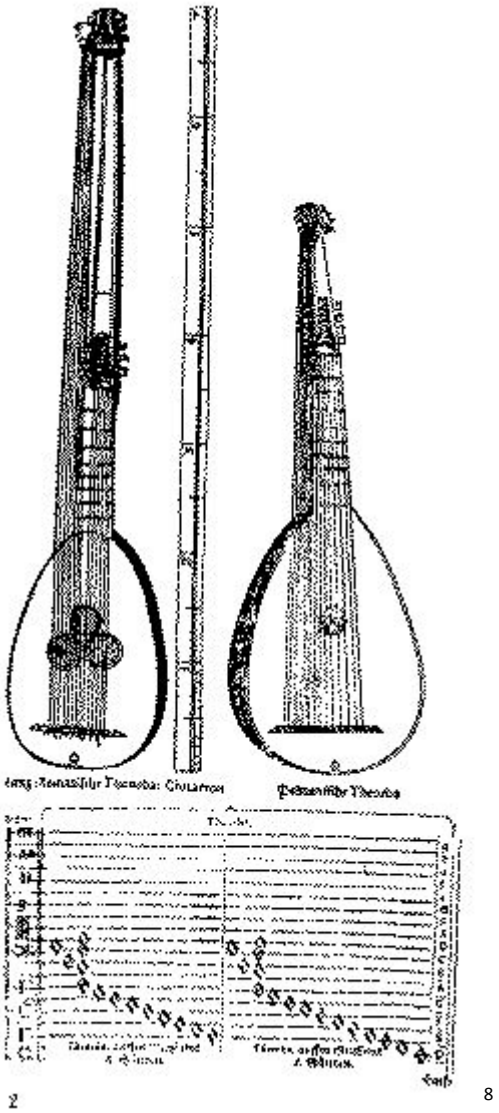
Banchieri and Praetorius both gave tuning charts for the chitarrone or tiorba, terms that were more or less interchangeable after ~1600. Interestingly, both tuning charts suggested a tuning in G, although later sources such as Kapsberger, etc gave a tuning in A. Banchieri's tuning chart[7] seems to suggest an optional single re-entrant tuning, while Praetorius's tuning is clearly double re-entrant.



[6] Lauri Niskanen's lute string calculator https://www.niskanenlutes.com/index.php?p=stringcalc#V1_NRenaissance+Lute_T0_A440_L-0-Fingerboard-60_S0Y0NguT3.8_S1Y0NduT3.2M3.2Pdu_S2Y0NaT3M3Pa_S3Y0NfT2.9M2.9Pf_S4Y0NcT2.9M2.9Pc_S5Y0NGT2.8M2.5Pg_S6Y0NFT2.8M2.5Pf_S7Y0NET2.8M2.5Pe_S8Y0NDT2.8M2.5Pd_S9Y0NCT2.8M2.5Pc_E

[7] Banchieri, Conclusioni nel Suono dell' organo, op. 20 (Bologna, 1609), p 68-70

Praetorius also distinguishes between two types of theorbos: Paduan and Roman, as shown in the picture below. Very interestingly, Praetorius has provided a scale in Brunswick feet and inches. A rough measuring concludes that the “Long Roman theorbo/chitarrone” has a string length of around 88/176cm, while the Paduan theorbo has a massive stopped string length of 97cm, with relatively short dispasons reaching 131cm. This is quite a surprise to me initially, since I was under the impression that Paduan instruments were smaller with shorter stopped string lengths.



[8] Michael Praetorius, Syntagma musicum band II De Organographia. Wolfenbuettel 1619

Besides this Praetorius drawing, iconography can only serve as peripheral evidence since it is very tricky to determine the size of a theorbo even in photographs and videos, let alone paintings that may not have been drawn to scale. Additionally, without knowing the height of the people drawn, it is even harder to determine the relative sizes of instruments.

Surviving Instruments

There are a handful of chitarroni that survived, either intact or in pieces, until today. These serve as a very good starting point for this study.

It is perhaps not a coincidence that most of the instruments that survived are highly decorated instruments from reputable makers such as Buchenberg, Tieffenbrucker and Sellas. Here is a list I have compiled featuring surviving chitarroni with string lengths measured, based on what I could find, without the intention to include or exclude instruments of certain sizes. Instruments that have undergone severe changes (e.g. shortened neck, 19th century style bridge) are not included. Sometimes multiple similarly sized instruments from certain makers have survived; when that's the case, I have chosen to include only significant examples.

- Magnus Tieffenbrucker ~1600, made in Venice. String lengths 90.3/171.4cm, Conservatorio A. Venturi, Brescia, Italy
- Wendelio Venere 1606, made in Padova. String lengths 89.6/166.6cm, Musée de la Musique, Paris, France.

[9]

- Matheus Buchenberg 1608, made in Rome[10]. String lengths 88.5/160cm, Museu Nacional da Música, Lisbon, Portugal. This instrument has been restored to playing condition.
- Magno Dieffopruchar[11] 1608, made in Venice. String lengths 93/170.2cm, Royal College of Music Museum, London, England.
- Martinus Kaiser 1609, made in Venice. String lengths 88.5/171cm, Musée de la Musique, Paris, France[12].
- Matheus Buchenberg 1610, made in Rome. String lengths 98.5/169.7cm. Musical Instrument Museum , Brussels, Belgium.
- Vendelio Venere 1611, made in Padova. String lengths 75.3/121.2cm, Kunsthistorisches Museum, Vienna, Austria. [13]
- Jacob Stadler 1613, made in Naples. String length 89cm (upper extension did not survive), Musée de la Musique, Paris, France. [14]

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[9] https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=244&fbclid=IwAR2-bWlJD0NIZWoXM5UrDnJZtPN7FC0LpLo0KcNyERYLqgcuUSjuXwd5SIM

[10] Peça do Mês, Tiorba 'Buchenberg', Museu da Musica, http://www.museunacionaldamusica.gov.pt/images/stories/Peca%20do%20Mes/Museu_da_Musica_Peca_do_Mes_Dezembro_2014.pdf

[11] Tieffenbrucker, Magnus, chitarrone. http://minim.ac.uk/index.php/explore/?instrument=9165

[12] Kaiser, Martin, theorbe. https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0130249?_ga=2.151845180.485758191.1592068875-1959840386.1592068875

[13] Venere, Vendelio, theorbo(?). Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=264

[14] Stadler, Jacomo, Theorbe, Cité de la musique - Philharmonie de Paris, https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0130247?_ga=2.111336705.485758191.1592068875-1959840386.1592068875

- Matheus Buchenberg 1614, made in Rome. String lengths 88.5/159cm, Victoria and Albert Museum, London, England. This is the Buchenberg model many modern luthiers like to base their instruments on.

 [15]

- Giorgio Sellas 1626, made in Venice. String lengths 96.1/177.3cm, Musée de la Musique, Paris, France.

 [16]

- Matteo Sellas 1630, made in Venice. String lengths 74/154cm, Musical Instrument Museum , Brussels, Belgium.

[15] Buchenberg, Matteo, Chitarrone, Victoria and Albert Museum, http://collections.vam.ac.uk/item/O58902/chitarrone-buechenberg-matteo/

[16] Sellas, Giorgio, theorbe, Cité de la musique - Philharmonie de Paris,https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0157880?_ga=2.17904316.485758191.1592068875-1959840386.1592068875

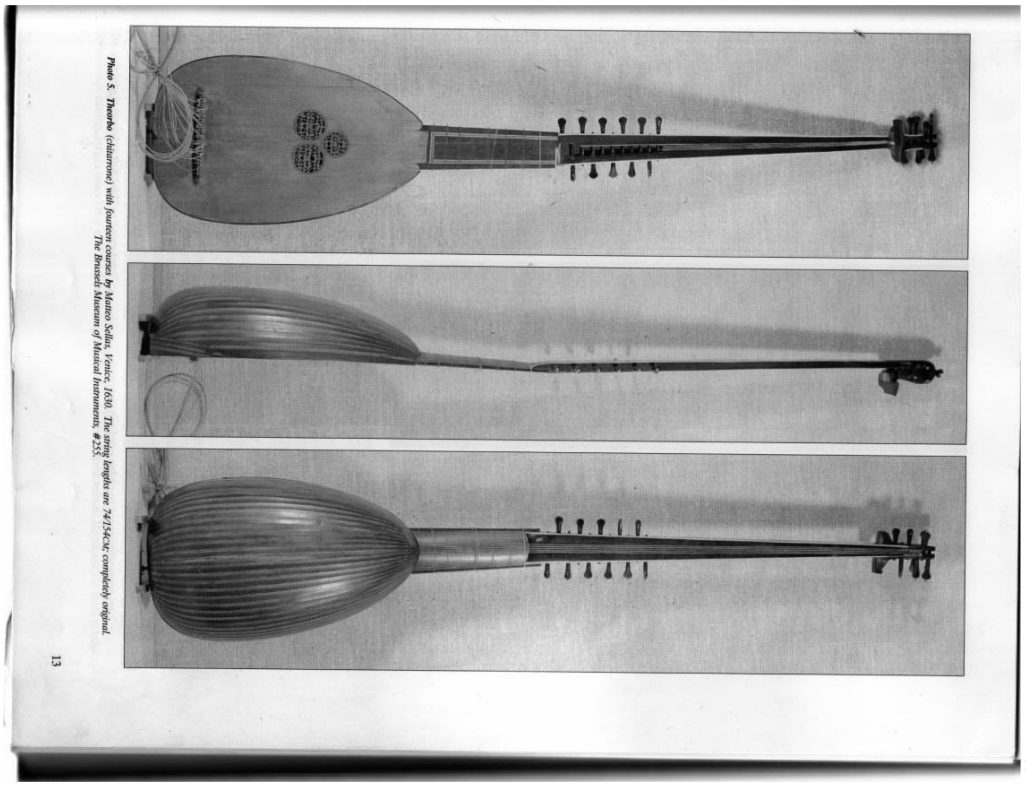
Photo 5. Theorbo (chitarrone) with fourteen courses by Matteo Sellas, Venice, 1638. The string lengths are 74/154cm; completely original. The Brussels Museum of Musical Instruments, #253.

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[17]

- Peter Köpff 1637, string lengths 88.7/157cm, Oberösterreichisches Landesmuseum, Linz, Austria
- Pietro Railich, year unknown, string lengths approx. 79.3/162cm, Musical Instrument Museum , Brussels, Belgium. [18]
- Matteo Sellas 1640, made in Venice, string lengths approx. 85/168cm. [19]
- Matteo Sellas 1640, made in Venice, string lengths 88.5/164cm, Museu de la musica, Barcelona, Spain.
- Matteo Sellas 1640, made in Venice, string lengths 89/130.1cm, double strung throughout. Musée de la Musique, Paris, France.

[17] Lundberg, Robert.Historical lute construction, page 13, Tacoma, Wash. : Guild of American Luthiers, 2002

[18] Schreiner, Michael. Theorbo by Pietro Railich, Musical Instrument Museum , No.1569, Brussels, https://web.archive.org/web/20150403140239/http://www.schreinerlutes.com/projects_railich_theorbo.html

[19] Sellas, Matteo I, Theorbe. Cité de la musique - Philharmonie de Paris, https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0161804?_ga=2.126033544.485758191.1592068875-1959840386.1592068875#

[20]

- Jachomo Tieffenbrucker 17th century, made in Milan, string lengths 88.7/166.2cm. Musée de la Musique, Paris, France. [21]
- Matthias Alban 1696, made in Bozen. String lengths 88/183.7cm, Ueno Gakuen College, Tokyo, Japan. [22]
- Magnus Steger 1690, made in Venice. String lengths 92/169.5cm, Ueno Gakuen College, Tokyo, Japan. [23]
- Christoph Koch 1650, made in Venice. String lengths 82.7/167.5cm, Staatliches Institut für Musikforschung, Berlin, Germany. [24]
- Sebastian Schelle 1728, made in Nuremberg. String lengths 88/160cm, in d minor tuning. Germanisches Nationalmuseum, Nuremberg, Germany. [25]

What can we conclude from this list of instruments? I have these observations:

[20] Sellas, Matteo I, Theorbe. Cité de la musique - Philharmonie de Paris, https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0161799?_ga=2.177525280.485758191.1592068875-1959840386.1592068875
[21] Tieffenbrucker, Jachomo, theorbo. Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=782
[22] Alban, Matthias, theorbo. Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=347
[23] Steger, Magnus, theorbo. Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=346
[24] Koch, Christoph, theorbo. Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=228
[25] Schreiner, Michael, Sebastian Schelle Theorbo. http://schreinerlutesandguitars.blogspot.com/2017/06/sebastian-schelle-theorbo.html

88/88.5/89cm seems to be a really common string length for a chitarrone, as if makers across Europe agreed on it throughout the 17th and well into the 18th century. By today's standards, chitarroni of such sizes are considered behemoths, while they were just the standard sized instruments back in the days. I am certain not the only one to arrive at this conclusion. Lynda Sayce wrote this in her article Theorbo sizes, the uncomfortable truth:

"Historically, theorbos came in several sizes, almost all of them larger than the average modern instrument. The largest are instruments by Buchenberg and Graill, which have stopped string lengths of 98-99 cm. Not far behind are instruments by Giorgio Sellas at 96cm, Magno Dieffopruchar at 93cm, and Alban, Schelle, Buchenberg and many others, in the high 80s. These are not the exceptions but the norm: surviving old theorbos which are significantly smaller are extremely unusual, yet these are the norm today. In scaling down modern theorbos purely for convenience, we are attempting the equivalent of making a cello function as a double bass. A bass presents different technical problems from a cello, and of course it is more cumbersome to carry around - but people still learn the bass! If we have any respect and love for historic instruments, (and why else would we want to play or make them?), we should respect them for what they are, and learn to play on them as they are, not on scaled-down toy versions. Opting for inauthentically small instruments may save us the effort of learning to play on the big ones, but in doing so we are not recreating the historical theorbo; we are inventing a new instrument, and one which is wholly dependent upon modern string technology in order to function."[26]

Michael Lowe also has a similar list of instruments in his lecture In Defence of Real Lutes and Theorbos - Why History Matters which he originally gave at a German Lute Society conference in 2017. In the lecture, he remarks:

[26] Sayce, Lynda, Theorbo sizes: the uncomfortable truth. http://www.theorbo.com/theorboinformation/theorboinformation/players_assets/Theorbo%20sizes.pdf

“As I said, I see many people today playing on instruments which are far too small to be real theorbos, or, at least, are only suitable as theorbos with just the first course lowered an octave like the 1611 Venere in Vienna or the Matteo Sellas instrument in Brussels.”

Sellas 1640 in Paris (although doubly strung throughout) is the best example that resembles the Paduan instrument in Praetorius’ drawing.
Sellas 1630 in Brussels (74cm stopped string length) is a very popular instrument modern makers base their theorbos on today. Modern makers can make it with 9 or 10 frets on the neck, with a string length of 74-78cm. However, this particular instrument seems too much of an outlier when compared to the majority of chitarrone which are much larger. It is, rather, much closer in size to the 71cm Tecchler archlute at the Metropolitan Museum of Art.

27

What was a probable stringing for this Sellas? I will cover this in later chapters.

[27] Tecchler, David, archlute. The Metropolitan Museum, (https://www.metmuseum.org/art/collection/search/503613)

Testing Method for String Breakage and Results

The best way to find out whether certain stringing and tuning worked for instruments of certain sizes would be to conduct some tests with strings available to us today. Although there is no way of knowing for sure, like many subjects related to historical performance, it is generally assumed that historical strings are stronger, especially if they are not rectified like most modern gut strings are, with potential structural damage occurring during the process of rectification. For this test, I have selected to include strings gauged at around 0.40mm, the thinnest existing historical gauge, commonly used for a lute's chanterelle. There were a total of 8 pure gut strings used: 2x Aquila 40HU, 2x Aquila 44HU, 2x Gamut 0.40mm, 2x Gamut 0.44mm. Solely for the purpose of nudging modern players to try out historically probable stringing, I have also included four Aquila Nylgut strings: 2x 40NNG and 2x 44NNG.

All tests were done on a large Buchenberg copy made by Lauri Niskanen in Tampere, Finland. The Buchenberg originally had a stopped string length of 88.5cm. In 2017, the fingerboard was extended to 95.5cm to accommodate 10 frets on the neck. The first four frets on the neck, when pressed down, gave vibrating string lengths of 90cm, 85cm, 80cm, and 76cm, which happen to be common sizes for what is referred to as a theorbo in modern times.

Based on the extent of surviving instruments, I set the target pitch to C4, at A=415. At the fourth fret (76cm), the note would be an E4, the note of a non-re-entrant theorbo second course. If a string can be stably tuned to C4 at 95.5cm, we can then say it is possible for a theorbo with 76cm stopped strings to be strung singly re-entrant, at A=415. With each half tone gain above C, the string length gains one fret's length. Here are the results from all the strings:

String	Last stable pitch	breakage pitch
Aquila 40HU		~Bb3
Aquila 40HU		~Bb3
Aquila 44HU		~B3
Aquila 44HU		~B3
Gamut 0.40mm	D4	~Eb4
Gamut 0.40mm	D4	Did not continue tuning up after stable D4
Gamut 0.44mm	D4	~Eb4
Gamut 0.44mm	D4	Did not continue tuning up after stable D4
Aquila 40NNG		~B3
Aquila 40NNG		Just below C3
Aquila 44NNG	D4	Just below Eb4
Aquila 44NNG	D4	Did not continue tuning up after stable D4

One can see that all the Gamut gut strings performed exceptionally well. While Aquila gut strings failed before target pitch was met, the success of Gamut strings alone should be able to conclude that historical gut strings, if made properly, could most probably support single re-entrant theorbo tuning with string lengths as large as 85cm, at A=415. This conclusion could very well be an explanation of why so many 17th and 18th theorbos by makers across Europe had fingerboard strings of 88-89cm- it was the shortest length that deemed double re-entrant necessary, and not so uncomfortably large to make solo playing all but impossible.

If we were to take the standard pitch of 17th century Rome (from where many of the largest instruments by Buchenberg, Graill, etc originated), believed to be around A=390[28], one can see that an A theorbo as large as 90cm can still have its second course up the octave. At Venetial pitch of A=465, A-tuning theorbos over 76cm and G-tuning theorbos over 85cm will probably have to have their second courses lowered an octave.

Now we can take a closer look at the 74cm Sellas in Brussels. Long used as the base model for the popular small theorbos of today, its stringing and tuning are now in question. Aside from the results of my stringing test which makes the 74cm instrument's double re-entrant tuning less than reasonable, there is another similarly sized instrument whose existence could suggest a different tuning for the Sellas - Lesser French theorbo[29], or théorbe pour les pièces, as opposed to théorbe d'accompagnement or Greater French theorbo. Most instruments of this type today are built based on the instrument at Yale University, with a stopped string length of 74-76cm, tuned double re-entrant in D.

[28] Haynes, Bruce, History of Performing Pitch: The Story of "A". Scarecrow Press, November 2002
[29] M. Prynne, 'James Talbot's Manuscript: IV Plucked Strings The Lute Family', Galpin Society Journal XIV (1961) pp 59-60), accessed through Robert Spence's article 'Chitarrone, Theorbo and Archlute' on David van Edwards' website: https://www.vanedwards.co.uk/spencer/html/spencer2.htm

While these two instruments (74cm Brussels Sellas and Yale French theorbo in D) originated from different regions (the Yale instrument had a Vendelio Venere sticker inside. Presumably, it was one of the instruments the French enthusiastically bought from Italy and converted to their own needs, according to Piccinini), there is hardly any reason why two similarly sized instruments should be tuned a 4th apart. If the Sellas in Brussels was to take on a single re-entrant tuning, the puzzle pieces will seem to fit together- the top string on both instruments would be E4, conforming to the norm of tuning the highest string near breaking point on lutes. [30]

Looking back at the Piccinini introduction, he specifically mentions that in 1623, the year of the publication, single re-entrant tuning was still used:

The quality of these large lutes revealed itself all the more when the tuning was raised to a point where the first string, unable to be tuned so high, was replaced with another, thick string tuned an octave lower. This succeeded with such good effect that it is still done today. After some time, when il bel cantare began to flourish, it

[30] Robinson, Thomas. The Schoole of Musicke, London: printed by Thomas Este for Simon Waterson, 1603.

seemed to these virtuosi that these large lutes, being so sweet, would be very appropriate for accompanying a singer. But finding them tuned much too low for their needs, they had to furnish them with thinner strings and tune them up to a pitch comfortable for the voice. Since the second [strings] could not be tuned so high, they were tuned down an octave just like the first. [31]

What could Piccinini possibly mean by "This succeeded with such good effect that it is still done today?" other than that single re-entrant tunings were still prevalent in 1623? Considering the 1630 Sellas was built only seven years after the publication of Piccinini's tablature, one must not rule out the possibility that this instrument was intended for single re-entrant continuo use.

Another interesting instrument to look at is the 1728 Schelle, at 88cm. This instrument was intended to be tuned in a d minor tuning, much like a baroque lute, but without the top string, which makes the highest string a D. This coincides with the English theorbo which also has a top string of D.

Thus far, all evidence points to a direction away from the assumption that theorbos and chitarroni of all sizes employed the same stringing and tuning. It is quite clear that an instrument around 74-76mm mensur should have a top note of E instead of B. What are the chances of a 88cm string being tuned a minor third higher than, for example, a 76cm string, on an instrument of the same family, in roughly the same period? Like everything else in the world, there are always going to be "outliers" who did their own thing, but it would be illogical to consider such outliers as the norm of the time.

[31] Piccinini

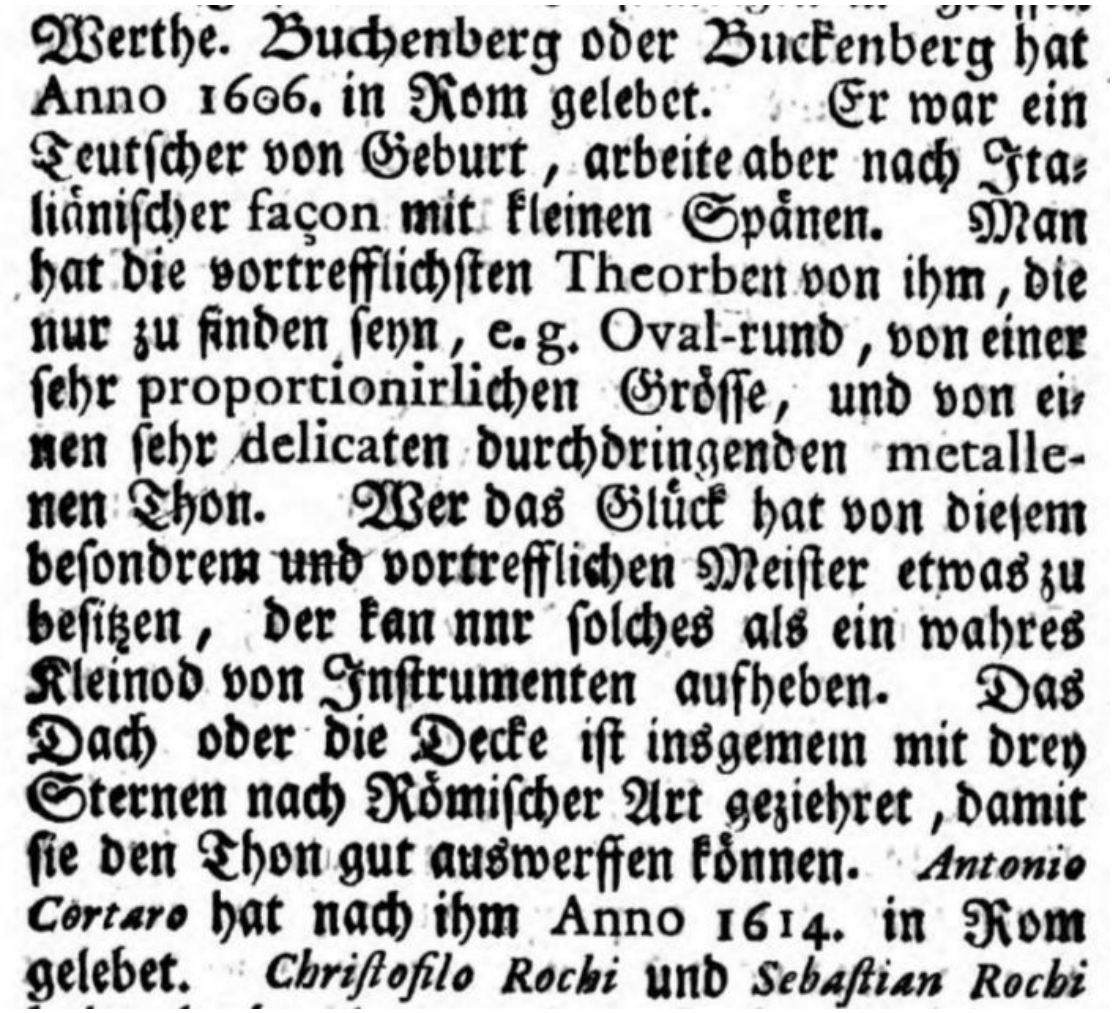
Tone Comparison

We often hear the expression of an instrument sounding bright, dark, round, dry, etc. Can we visualize and quantify the acoustic characteristics of instruments? We can, to some extent.

If we put aside all other differences (body size, bracing, material) and focus on string length alone, then theoretically, a longer string tuned to the same pitch as a shorter string would sound brighter, because it is thinner. It may also resonate louder and longer, because a longer string length demands a higher tension. This is, in fact, how I would describe the sound of a large theorbo when compared to a small one: brighter and darker at the same time; louder and more (nasally) resonant, with a singing quality.

While the textual description of this sound might not seem immediately desirable, especially when compared to a renaissance lute, where sustain has never been a forte, one must realize that the chitarrone and the lute are as different as a cello and a double bass. According to Ernst Gottlieb Baron (1727)[32], " Buchenberg or Buckenberg lived in Rome in 1606. He was german born but nevertheless built after the italian fashion with thin ribs. The finest theorbos to be found are by him, e.g. they are oval-round, are of a very well proportioned largeness and have a very delicate penetrating metallic tone. Whoever has the luck to own an instrument from this outstanding and excellent master can cherish it as a true treasure amongst instruments. The soundboards are adorned with three roman style stars (roses), so that the instrument's sound projection is excellent."

[32] Baron, Ernst Gottlieb, Untersuchung des Instruments der Lauten, 1727



Werthe. Buchenberg oder Buckenberg hat Anno 1606. in Rom gelebet. Er war ein Teutſcher von Geburt, arbeite aber nach Italiäniſcher façon mit kleinen Spänen. Man hat die vortrefflichſten Theorben von ihm, die nur zu finden ſeyn, e.g. Oval-rund, von einer ſehr proportionirlichen Gröſſe, und von einen ſehr delicaten durchdringenden metallenen Thon. Wer das Glück hat von dieſem beſondrem und vortrefflichen Meiſter etwas zu beſitzen, der kan nur ſolches als ein wahres Kleinod von Inſtrumenten aufheben. Das Dach oder die Decke iſt insgemein mit drey Sternen nach Römiſcher Art geziehret, damit ſie den Thon gut auswerffen können. *Antonio Cortaro* hat nach ihm Anno 1614. in Rom gelebet. *Chriſtofilo Rochi* und *Sebaſtian Rochi*

For this test I used mainly two instruments: a Buchenberg 1614 copy made by Lauri Niskanen (95.5cm) and a Sellas 1630 copy made by Sebastián Núñez (78cm). Additionally, a third instrument made by Günter Mark (own design, 76cm) was used to demonstrate the tone in an ensemble setting. This 76cm instrument was strung with the second course up an octave, or single re-entrant. All comparative recordings were made with the same distance from soundboard to microphone, and with the same gain settings on the microphones.[33]

[33] Recording gear used for single notes and de Visee prelude listed here:
Microphones: Schoeps CMC6U MK2s pair;
Microphone pre-amplifiers: Sonosax SX-M2;
D/A conversion: Zoom F8;
Digital audio workstation and plug-ins: Reaper, Ozone 9 Advanced;
Monitors/headphones: JBL 305p MKII, Hifiman R2R2000 and Arya.

The first comparison would be between single notes on the Buchenberg and Sellas. I chose the first course (A3) and sixth course (A2) for this comparison. Through Ozone 9's equalizer, I was able to capture the frequency response (FR) of each note at its peak. The sound of the first courses (A3) looks like this:
(Those pictures are stand-ins. I will eventually do a screen capture instead of using pictures of the screen)

Sellas A3

Buchenberg A3

One of the first things to notice is the Sellas has got a more prominent octave harmonics than the fundamental pitch, while the Buchenberg produces consistent

loudness of harmonics up to 1000hz. The Buchenberg also has significantly more harmonics in the 2000-3000hz range, as well as 6000hz and beyond. This accounts for the brightness in the sound.

Sellas A2

Buchenberg A2

The FR of the sixth courses is more interesting to look at. One can notice the fundamental pitch on the Buchenberg being much more prominent, as well as areas above 2000hz. Thus, one can describe this sound as both darker and brighter at the same time- it has richer harmonics as well as more bass impact. [34]

[34] Although the string material here is vastly different (nylgut on the Buchenberg and copper wound string on the Sellas), it is this way for very practical reasons: using gut or nylgut on an 78cm mensur would result in a very thick and unwieldy string for courses 6 and beyond, and the acoustic properties

For all notes on the Sellas, please listen to **recording 1**. For all notes on the Buchenberg, please listen to **recording 2**.

With rich harmonics and thumpy bass as well as a higher tension, larger theorbos can generally be played louder than smaller instruments that use the same tuning. The important part, however, might not be the sheer loudness of an instrument. While a small theorbo can surely be heard in a moderately sized ensemble if the player plays fortissimo all the time, a large theorbo doesn't have to struggle as much to cut through the texture of the ensemble, and can thus play at a more similar affect as the rest of the group.

For smaller theorbos, using single re-entrant tuning can gain many benefits. For demonstration, I have included two clips from the same recording session, albeit on different pieces of music. The smaller instrument used here is made by Gunter Mark, with a stopped string length of 76cm. The larger instrument here is the same Lauri Niskanen Buchenberg copy at 95.5cm. Seating position, microphone gain, as well as post processing remain unchanged.[35][36]

For the 76cm instrument, see **recording 3**. For the 95.5cm instrument, see **recording 4**.

Despite the Buchenberg being the louder of the two instruments, the single re-entrant 76cm instrument is at least as audible, due to the brightness of its second

would be less than desirable (a very dull sound). While lutes typically employ an octave string on the 6th course to compensate for this problem, it is not possible for single-strung instruments such as the theorbo.

[35] In the two clips, the position of instruments may sound different. It is because the phase was inverted to accommodate visual needs for the video.

[36] Performers: Meili Li, countertenor; Chia-hua Chiang, cello; Mimoe Todo, harpsichord; Menglin Gao and Charlie Zhang, theorbos.
Recording gear used for Handel and Cavalli recitatives listed here:
Microphones: Schoeps CMC6U MK2s pair, CMC6 MK4 x2, CMC6 MK21 x2; DPA 4060;
Microphone pre-amplifiers: Sonosax SX-M2, SX-M2D2; D.A.V Broadhurst Gardens No.1;
D/A conversion: Zoom F8;
Digital audio workstation and plug-ins: Reaper, Ozone 9 Advanced, Altiverb 7.

course. It also has a different character to the sound- it is not quite a chitarrone, but more lute-like with its sweetness and delicacy. The Buchenberg, on the other hand, performs a very different role- it is much more outspoken and bass-oriented, and provides a lasting tone to complement the harpsichord, which is an instrument of quick decay. This combination produces a full continuo sound, which is perhaps why many composers ask for cello OR theorbo in addition to a harpsichord, since the sound of a "real" theorbo can, in fact, cover much of a cello's role, in suitable repertoire. I will not write too much on this topic here, since it belongs to an altogether different research.

A Discussion on Practicality

There are mostly two reasons players come up with against the use of large, historically sized theorbos or chitarroni. Reason one is the difficulty of transportation caused by the long diapasons, which often results in the instrument case being longer than two meters, making travel by air a significant risk, if not impossible. Reason two is the length of the scale for the left hand, which renders difficult solo music unplayable.

I would like to address these problems one by one. Firstly, since even a “small” theorbo can be as tall as 180cm when put in a case, a large instrument with an additional 20 or 30 centimeters hardly makes a difference. If we were to build instruments that aren’t strictly 1:2 in proportion regarding string length (diapasons being twice as long as the stopped strings is the norm), the diapasons can certainly be shortened to reduce the overall dimension of the instrument.
The original 1728 Sebastian Schelle instrument was one of the first theorbos to feature a foldable design.

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Nowadays, a number of luthiers[38] offer foldable neck extensions, many of whom have a design that retains string tension while the instrument is folded away for travel, thus enabling players to get off a plane and rehearse or perform immediately, rather than having to spend days to wait for the strings to stabilize. My Niskanen theorbo measures 137cm in its folded form, much shorter than the average "small" theorbo.[39]

The issue with playability of solo music on large instruments is more personal. There are a number of recordings of difficult solo Chitarrone repertoire with large instruments. They are Italian Virtuosi of the Chitarrone - Jakob Lindberg (89cms) BIS-CD-1899
Giovanni Girolamo Kapsperger - Francesco Romano (86cms) Amadeus AM 271-2
Giovanni Girolamo Kapsperger - Fred Jacobs (89cms) Metronome MET CD 1093, among others.

Do you need to have exceptionally large hands that enabled them to play large instruments? According to NASA's study Anthropometry and Biomechanics -

[37] Schreiner, Michael, Sebastian Schelle Theorbo. http://schreinerlutesandguitars.blogspot.com/2017/06/sebastian-schelle-theorbo.html
[38] David van Edwards, Klaus Jacobsen, Lauri Niskanen, Francisco Hervás are some of the luthiers who feature a folding design on their extended lute family instruments.
[39] For a demo of how the folding action works, https://www.youtube.com/watch?v=dxMPANMJDOQ

NASA-STD-3000[40], the average adult male hand measured from the tip of the middle finger to the first crease under the palm is 7.6 inches, or 19.3 centimeters. My hand measures 19.6 centimeters, just above average. In an Australian study of hand spans of pianists, my 1-5 finger span of 20.8 centimeters or 8.2 inches falls short of the arithmetic mean of 22.8cm. By looking at the graph, one can conclude that my hand size is rather small compared to the vast majority of male pianists, regardless of ethnicity.

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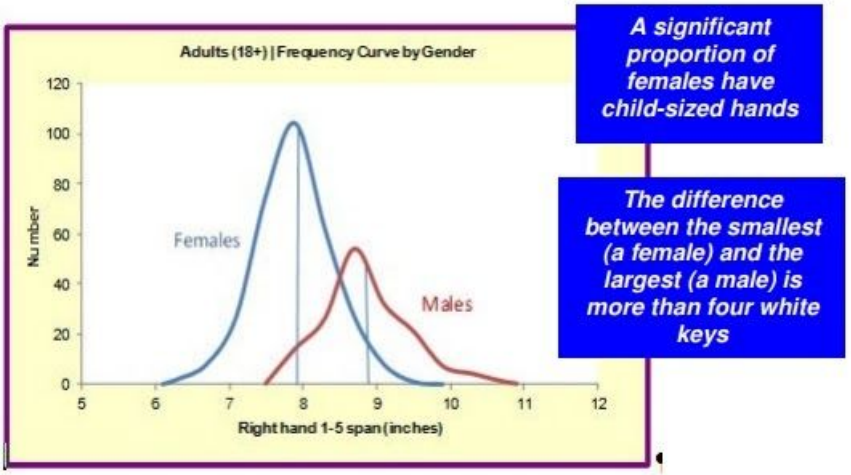

❑ *Significant variation in hand spans between Caucasians and Asians:*

Adult pianists – Male right hand 1-5 span by ethnicity – Key statistical measures				
	Caucasian Males		Asian Males	
Sample size	116		37	
	Inches	Centimetres	Inches	Centimetres
Minimum	7.8	19.8	7.8	19.7
Maximum	10.8	27.4	9.4	24.0
Arithmetic mean	9.0	22.8	8.7	22.0
Standard Deviation	0.60	1.52	0.38	0.97

Adult pianists – Female right hand 1-5 span by ethnicity – Key statistical measures				
	Caucasian Females		Asian Females	
Sample size	216		87	
	Inches	Centimetres	Inches	Centimetres
Minimum	6.4	16.3	6.8	17.2
Maximum	9.5	24.1	9.0	22.9
Arithmetic mean	8.0	20.2	7.8	19.8
Standard Deviation	0.54	1.38	0.45	1.15

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[40] ANTHROPOMETRY AND BIOMECHANICS, The National Aeronautics and Space Administrationhttps://msis.jsc.nasa.gov/sections/section03.htm

[41] Rhonda Boyle, Robin Boyle, and Erica Booker, "Pianist Hand Spans: Gender and Ethnic Differences and Implications for Piano Playing", presented to the Australasian Piano Pedagogy Conference, Melbourne, July 2015. www.appca.com.au)

[42] Boyle

With hands on the small side, I do not find it so difficult to play a 95.5cm instrument. With its low action and properly spaced strings, even Robert de Visee can be played. I have included two audio examples here: the Prelude from de Visee's suite in D from the Saizenay Manuscript, played on the Buchenberg 1614 copy made by Lauri Niskanen (95.5cm) and a Sellas 1630 copy made by Sebastián Núñez (78cm). Besides having to change a few fingerings to avoid large stretches, I did not find the Buchenberg any more difficult to play than the Sellas. While de Visee is certainly not repertoire suited for the early Italian Chitarrone, especially one that's larger than average, it is definitely not impossible, given that some fingerings are altered. In terms of continuo playing, one simply has to refrain from the usage of lute-like chord shapes and fingerings, especially those with many notes on the inner courses to successfully perform any continuo work. With an instrument rich in overtones, one can often play thinner harmonies with good effect.

For a recording of a de Visee prelude in D major: Sellas is **recording 5**; Buchenberg is **recording 6**. Please note that de Visee isn't meant to be played on instruments as large as 95.5cm, since both types of French theorbe are believed to be smaller. However, this recording shows that it is possible.

One of the things that is truly difficult on a large chitarrone would be a fast, running bass line. This is an area where large instruments fall short, since this kind of passage work has to involve too many shifts to make the effort worthwhile. One can compensate by using campanella, a technique that plays a line across many strings, but ultimately there would be less control in terms of dynamics and articulation. However, I am not entirely convinced that the chitarrone was historically used for such roles, at least not as the sole continuo instrument.

Conclusion

So far, we have gathered many pieces of information that suggest a certain trend of the historical theorbo/chitarrone- they were very large, and there were good reasons for this largeness; and when they weren't so large, they were probably tuned differently. The long string length allows for an overtone-rich, incisive tone that penetrates orchestral texture while at the same time provides enough bass and sustain to be useful as a bass instrument in a basso-continuo setting. Surviving instruments suggest that instruments on the large side were the overwhelming majority. I have made a side-by-side mostly to-scale comparison of surviving instruments as well Praetorius' drawing here:

It is very clear that theorbos smaller than 80cm was the exception rather than the norm. The most common size seemed to be around 88 or 89cm, a size considered very large by today's standard. Any player with reasonably sized hands can easily play an instrument at 85cm or above- it is just a matter of getting used to the size, like double bass players. I find it important to adapt one's technique to the instrument as it is, rather than scaling down the instrument to fit one's technique.

What about players who already own a theorbo shorter than 80cm? Historical trends of lute family instruments as well as the result of my string tests seem to suggest single re-entrant tunings, or perhaps a double re-entrant tuning in D, like a French théorbe pour les pièces. It is far more logical to have a top note of D or E rather than a B on instruments of such sizes.

The field of early music has been coping with many inconveniences of historical instruments, such as the fragility and sensitivity of gut strings, the frequent tuning requirements of harpsichords, as well as many others, just to gain an inch towards replicating a sound the composers themselves may have been familiar with. As a "junior" player with limited technique, I find a lot of joy in playing a large, singing chitarrone, whose benefits far outweigh its limitations, as well as a smaller, single re-entrant instrument which opens up many voice leading possibilities on top of having a bright tone that easily cuts through an ensemble. Thus I conclude that the lute community has no real reason to ignore authenticity in favor of convenience regarding the chitarrone and the theorbo. To quote a remark often made by the inimitable Nigel North to his students:

"If I can do it, you can do it. "

Bibliography

Agazzari, Agostino. Del sonare sopra'l basso con tutti li stromenti e dell'usu loro nel conserto, Siena, Deomnico Falcini, 1607

Alban, Matthias, theorbo. Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=347 Last accessed 10.19.2020

ANTHROPOMETRY AND BIOMECHANICS, The National Aeronautics and Space Administrationhttps://msis.jsc.nasa.gov/sections/section03.htm Last accessed 11.6.2020

Banchieri, Conclusioni nel Suono dell' organo, op. 20 (Bologna, 1609), p 68-70

Baron, Ernst Gottlieb, Untersuchung des Instruments der Lauten, 1727

Rhonda Boyle, Robin Boyle, and Erica Booker, "Pianist Hand Spans: Gender and Ethnic Differences and Implications for Piano Playing", presented to the Australasian Piano Pedagogy Conference, Melbourne, July 2015.

Buchenberg, Matteo, Chitarrone, Victoria and Albert Museum, http://collections.vam.ac.uk/item/O58902/chitarrone-buechenberg-matteo/ Last accessed 10.19.2020

Haynes, Bruce, History of Performing Pitch: The Story of "A". Scarecrow Press, November 2002

Kaiser, Martin, theorbe. https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0130249?_ga=2.151845180.485758191.1592068875-1959840386.1592068875 Last accessed 10.19.2020

Koch, Christoph, theorbo. Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=228 Last accessed 10.19.2020

Lundberg, Robert.Historical lute construction, page 13, Tacoma, Wash. : Guild of American Luthiers, 2002

Monteverdi, Claudio. "L'Orfeo", Venice, 1609

Lauri Niskanen's lute string calculator https://www.niskanenlutes.com/index.php?p=stringcalc#V1_NRenaissance+Lute_T0_A440_L-0-Fingerboard-60_S0Y0NguT3.8_S1Y0NduT3.2M3.2Pdu_S2Y0NaT3M3Pa_S3Y0NfT2.9M2.9Pf_S4Y0NcT2.9M2.9Pc_S5Y0NGT2.8M2.5Pg_S6Y0NFT2.8M2.5Pf_S7Y0NET2.8M2.5Pe_S8Y0NDT2.8M2.5Pd_S9Y0NCT2.8M2.5Pc_E, last accessed 10.20.2020

North, Nigel. Continuo Playing on the Lute, Archlute and Theorbo,. London and Boston: Faber Music in association with Faber & Faber,. 1987

Peça do Mês, Tiorba 'Buchenberg', Museu da Musica, http://www.museunacionaldamusica.gov.pt/images/stories/Peca%20do%20Mes/Museu_da_Musica_Peca_do_Mes_Dezembro_2014.pdf Last accessed 10.19.2020

Alessandro Piccinini, "Intavolatura di Liuto et di Chitarrone, Libro Primo (Bologna: Gio. Paolo Moscatelli, 1623)

Praetorius,Michael. Syntagma musicum band II De Organographia. Wolfenbuettel 1619

M. Prynne, 'James Talbot's Manuscript: IV Plucked Strings The Lute Family', Galpin Society Journal XIV (1961) pp 59-60), accessed through Robert Spence's article 'Chitarrone, Theorbo and Archlute' on David van Edwards' website: https://www.vanedwards.co.uk/spencer/html/spencer2.htm Last accessed 11.5.2020

Robinson, Thomas. The Schoole of Musicke, London: printed by Thomas Este for Simon Waterson, 1603.

Sayce, Lynda, Theorbo sizes: the uncomfortable truth. http://www.theorbo.com/theorboinformation/theorboinformation/players_assets/Theorbo%20sizes.pdf Last accessed 10.19.2020

Schreiner, Michael. Theorbo by Pietro Railich, Musical Instrument Museum , No.1569, Brussels, https://web.archive.org/web/20150403140239/http://www.schreinerlutes.com/projects_railich_theorbo.html Last accessed 10.19.2020

Schreiner, Michael, Sebastian Schelle Theorbo. http://schreinerlutesandguitars.blogspot.com/2017/06/sebastian-schelle-theorbo.html Last accessed 10.19.2020

Sellas, Giorgio, theorbe, Cité de la musique - Philharmonie de Paris,https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0157880?_ga=2.17904316.485758191.1592068875-1959840386.1592068875 Last accessed 10.19.2020

Sellas, Matteo I, Theorbe. Cité de la musique - Philharmonie de Paris, https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0161804?_ga=2.126033544.485758191.1592068875-1959840386.1592068875# Last accessed 10.19.2020

Sellas, Matteo I, Theorbe. Cité de la musique - Philharmonie de Paris, https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0161799?_ga=2.177525280.485758191.1592068875-1959840386.1592068875 Last accessed 10.19.2020

Smith, Douglas Alton. "On the Origin of the Chitarrone." Journal of the American Musicological Society 32, no. 3 (1979): 440-62. Accessed October 23, 2020.

Stadler, Jacomo, Theorbe, Cité de la musique - Philharmonie de Paris, https://collectionsdumusee.philharmoniedeparis.fr/doc/MUSEE/0130247?_ga=2.111336705.485758191.1592068875-1959840386.1592068875 Last accessed 10.19.2020

Steger, Magnus, theorbo. Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=346 Last accessed 10.19.2020

Tecchler, David, archlute. The Metropolitan Museum, (https://www.metmuseum.org/art/collection/search/503613) Last accessed 10.19.2020

Tieffenbrucker, Jachomo, theorbo. Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=782 Last accessed 10.19.2020

Tieffenbrucker, Magnus, chitarrone. http://minim.ac.uk/index.php/explore/?instrument=9165 Last accessed 10.19.2020

Description of the 1606 Venere.
https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=244&fbclid=IwAR2-bWlJD0NIZWoXM5UrDnJZtPN7FC0LpLo0KcNyERYLqgcuUSjuXwd5SIM Last accessed 10.19.2020

Venere, Vendelio, theorbo(?). Lute Society of America database, https://home.cs.dartmouth.edu/~lsa/associated/database/dbdetail.php?PID=264 Last accessed 10.19.2020