
CULTURAL ORIGINS OF THE MODERN GUITAR

By R. E. Bruné

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Definitions

Let's try an experiment. I'll say the word "guitar" and you form an image of the first thing that comes to mind. Got it? Now, does your guitar look like a beautiful Spanish classical guitar? If you're a rocker, maybe you envisioned an amoebic-shaped, candy apple red Stratocaster. Or maybe a wire strung 12-string with a jumbo body. Or maybe if you play in a country band it was a horizontal console with pedals played with a sliding steel bar and decorated with rhinestones. Guitars all, but how to define them is the question. Like the 16th century Spanish term *vihuela*, today the word "guitar" covers an enormous gamut of forms, styles and musical cultures.

For convenience we have added certain clarifications to indicate a specific type of guitar, such as the term "Spanish guitar," which any good jazz player will tell you is the steel string model played with a plectrum. Of course, the music played on the "Spanish guitar" is not Spanish, and Spaniards never used steel strings on their guitars. In fact, this totally ambiguous term is an unfortunate leftover of the English who used it to differentiate the imported "Spanish" guitar played by Francesco Corbetta from the proper English guitar, which was actually a wire strung descendent of 17th century Italian citterns.¹ Most of our "clarifications" of specific types of guitars are more properly obfuscations. The Hawaiian

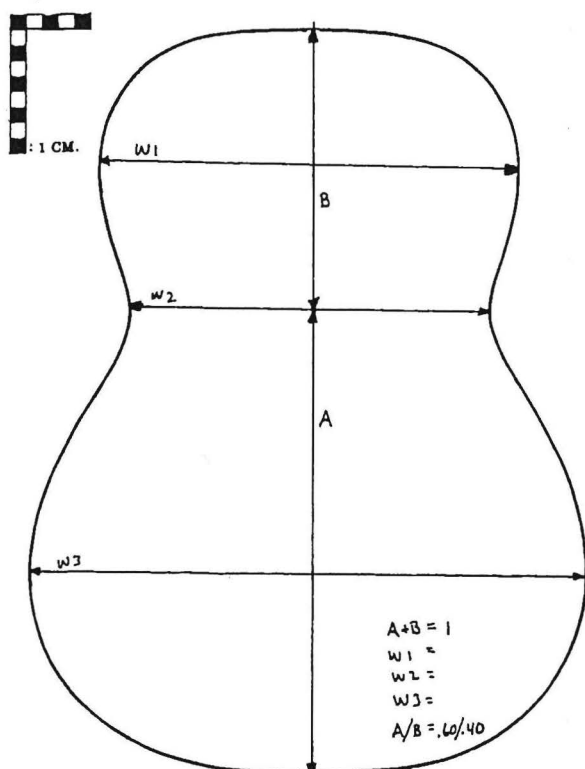
guitar isn't Hawaiian, although it has become popular there. The acoustic guitar is a complete misnomer. Did you ever hear a guitar that didn't make sound? Do classical guitarists only play music of the classical era? In fact, how do you define a "classical" guitar?

Today, no matter where you go in the world, classical guitar players all play instruments that look very much alike. Most of you can't differentiate one maker's instrument from another's when you see them played on a stage. I know, because it's probably the question asked most of me after a concert by fellow concertgoers. According to the 1984 *New Grove Dictionary of Musical Instruments*, the guitar is a "string instrument of the lute family, plucked or strummed, and normally with frets along the fretboard." They also note the wide range of morphology exhibited over the centuries. Rather than even hazard a definition of a "classical" guitar, they merely provide a schematic diagram along with several paragraphs of misinformation regarding its construction.² Curiously, they missed the obvious when they gave the typical dimensions of the classical guitar.³ If we express these measurements in terms of ratios or more precisely percentages of a whole, we can very easily define a certain proportion or model of guitar.

In fact, their given dimensions conform within less than 5% of the dimensional proportions of any Antonio de Torres guitar. While there are many ways in which the proportions of the measurements of guitars can be expressed, for the sake of simplicity I have chosen the

following dimensions in order to mathematically define the Antonio de Torres model of guitar (see figure 1). If we take the length of the back of any given Torres and express it as one unit of measurement, then the ratio of the width of the upper bout to the back will be about .56 plus or minus .04; the ratio of the waist to the back will be about .50 plus or minus .02; the ratio of the width of the lower bout to the back will be about .73 plus or minus .05, and the placement of the waist in relation to the overall length of the back is a ratio of .60:40 plus or minus .01. I have examined many Torres instruments and I note these proportions to be universal. In contrast, if one takes other 18th and 19th century instruments that are not Torres influenced models, you will find significant proportional deviation, based solely on this very simple scheme. (See figure 3 on the next page).

Figure 1. Illustration of Measurement Points to Verify Torres Model

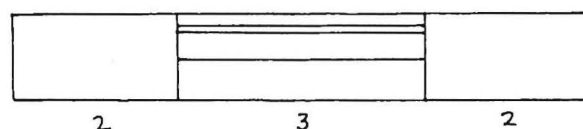


I should note that because I am only using 5 points of reference, this simplification does not take into account how the curves are filled in between the points of reference, and in theory, one could have an instrument of correct proportions but looking totally unlike any known Torres. Fortunately, the marketplace doesn't reward that type of gonzo lutherie, so we can safely use these mark-

ers to define the Torres model. When reputable dealers and luthiers examine and authenticate a guitar it is this very specific knowledge of the overall proportions and how a particular maker usually filled in the curves that serve to form the first accept/reject judgment that comes upon initial viewing.

However, we can get even closer to define our "classical" guitar in a mathematical sense. The traditional Torres bridge is basic and intrinsic to the model. With a few notable exceptions, it was used ubiquitously by Torres, and all that imitated him. Aguado describes this type of bridge in his methods, saying in the 1825 first edition that it is of modern invention. Later, in the 1843 edition he thinks he remembered inventing it in Madrid in 1824.⁴ Actually, his memory is not so good, because a guitar made by M. Hielo of Madrid dated 1822 recently surfaced which has exactly this style of bridge.⁵ Although we can establish a general set of proportions (figure 2) of

Figure 2. Bridge Proportions



width to length at 1:7, and express the ratios of the arms to the tie block as 2:3:2, there is more plus or minus variation here not only between various Torres bridges, but also the bridges of others who followed the Torres model. While it is obvious from Aguado's first method and a few surviving instruments that Torres did not invent this style of bridge, he did establish the general proportions. Outside of Andalusia in the 19th century there were nearly as many distinct bridge designs as there were makers, but once established by Torres, this model became ubiquitous within Andalusia.⁶

Finally, there is a third set of criteria we can use to identify the Torres Model, which is not as easy to analyze as the first two. Though no one today who is reasonably informed would suggest that Torres "invented" fan bracing, he did create a recognizable style of fan strutting (see figure 4) which has been widely imitated and elaborated upon by makers since Torres.⁷ Essentially it consists of numerous small strips of wood set parallel to and slightly obliquely to the grain of the top, whose function is to (ALARM: warning! Unsubstantiated opinions are about to appear!):

A: Support the top against the almost infinite stress of the strings;

**Figure 3. Comparison of Measurements
Torres models**

1858 Antonio de Torres	1884 Torres No. 71	1888 Torres No. 114
W1 = .52	W1 = .56	W1 = .56
W2 = .44	W2 = .47	W2 = .48
W3 = .69	W3 = .75	W3 = .74
A/B = .60/.40	A/B = .61/.39	A/B = .61/.39
Ca. 1860 Soto y Solares	1907 José Ramírez	1912 Manuel Ramírez
W1 = .57	W1 = .57	W1 = .56
W2 = .49	W2 = .50	W2 = .48
W3 = .74	W3 = .78	W3 = .75
A/B = .60/.40	A/B = .62/.38	A/B = .60/.40
Ca. 1860 Antonio Lorca	1937 Hermann Hauser	1956 Ignacio Fleta
W1 = .57	W1 = .57	W1 = .58
W2 = .49	W2 = .48	W2 = .49
W3 = .75	W3 = .74	W3 = .74
A/B = .60/.40	A/B = .60/.40	A/B = .60/.40

Measurement comparisons non-Torres models

1787 Joseph Benedid	Voboam baroque guitar	1823 Panormo
W1 = .51	W1 = .47	W1 = .48
W2 = .38	W2 = .42	W2 = .36
W3 = .61	W3 = .59	W3 = .64
A/B = .56/.44	A/B = .57/.43	A/B = .57/.43
Lacote	1862 J. G. Scherzer	Grobert
W1 = .53	W1 = .62	W1 = .54
W2 = .39	W2 = .46	W2 = .38
W3 = .69	W3 = .78	W3 = .67
A/B = .57/.43	A/B = .57/.43	A/B = .57/.43
Ca. 1900 C. F. Martin	1805 J. D. Paul	Ca. 1850 C. F. Martin
W1 = .51	W1 = .46	W1 = .46
W2 = .44	W2 = .37	W2 = .39
W3 = .73	W3 = .62	W3 = .65
A/B = .61/.39	A/B = .57/.43	A/B = .60/.40

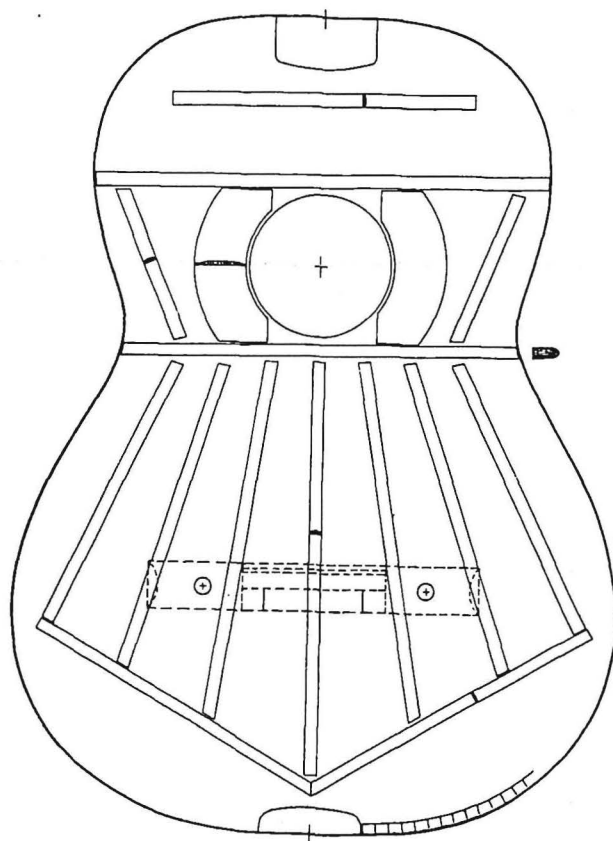
B: solely control the entire acoustical response of the guitar;

C: hold the top in its intended domed shape (for acoustical/structural reasons), or;

D: All or none of the above.

Volumes of material have been written on this subject, and as a luthier, I can assure you, just about all of it is irrelevant. Suffice to say, fan strutting is part of the grand recipe of the guitar, but hardly necessary from a structural standpoint. For our purposes, I am only referring to it as an identification marker to confirm the Torres model. During Torres' time, fan strutting was generally confined to Spanish makers. Later, as the Torres model emerged from Andalucía to the rest of the world, his pattern gradually replaced the antiquated European models in the hands of players, but more on this later.

Figure 4. Typical Soundboard Bracing of Antonio de Torres.



Variants

Up to now most of you are probably thinking that my comments apply primarily to the classical guitar and that the flamenco guitar was a variant that as José Romanillos states in his book on Torres, "...was therefore able to adopt the innovations introduced in the concert instrument."⁸

The New Grove Dictionary of Musical Instruments states, "Of 20th-century variants, the flamenco guitar is closest to the classical instrument."⁹ This sentence is a near verbatim quote of Jack Duarte's comment published in 1961 in *Guitar Review* No. 25.¹⁰ In the past I also subscribed to this unsubstantiated orthodoxy which in recent years I have come to reject. First, in order for this assumption to be correct, one must show that structurally speaking the classical and flamenco instruments are two different entities, and secondly, that the marketplace recognized and adhered to this supposed musical form of apartheid.

So, to carry this further let's assume that one can make an accurate description of either the classical or flamenco guitar. What would our criteria be? Materials? Design? Construction methods? Decoration? Usage? Let's start with materials, which are the most obvious. Does the use of cypress sides and back define a flamenco guitar? Let's take an obvious case, the 1884 Antonio de Torres 11 string guitar (segunda época, number 71), which was owned by José Rojo Cid.¹¹ As an 11-string guitar it has absolutely no musical function within the realm of flamenco. Or take the case of machine heads/pegs. I have had numerous instruments in my collection with non-cypress sides and backs fitted with pegs, such as the Antonio de Lorca of Málaga. The choice of pegs or machines was strictly an economic one, the pegs being cheaper. This can be confirmed by the catalogs of both Manuel and José Ramírez, which both list standard prices for the various models, along with the upgrade price for adding machineheads of various qualities.¹²

As for construction methods, I have examined hundreds of fine guitars of the late 19th and early 20th century, and there are no features in terms of fan strutting, body depth, or otherwise that suggest that they were ever intended specifically for one or the other genre of music. The presence or absence of a *golpeador* is not even an accurate indication. Of all the surviving Torres guitars listed in Romanillos' book, only one, the famous paper maché guitar of 1862 appears to have been fitted originally with a *golpeador*. Since this was Torres' personal instrument, one wonders if he was also a flamenco player. However, the instrument was reputed to have later belonged to Tárrega (who was not a flamenco player), from whom it passed to Miguel Llobet, whose daughter sold it to the Museo de la Música of Barcelona some years ago.

As for action height, the assumption that a lower action setup is indicative of a flamenco guitar is not safe. During Torres' era, most guitars were made with actions that are lower than classical players today would find acceptable. As an example, I can once again cite the 1884 11 string guitar #71 owned by José Rojo Cid. As I observed in my restoration report, the action of this guitar was set originally at less than 2.5mm (1/8") at the 12th fret, very low by today's standards.¹³ I have measured many 19th and early 20th century Andalusian instru-

ments, and my observation is that most were set up originally with low actions. Subsequent players and luthiers who have adjusted these guitars to conform to modern notions of action height have contributed to their demise, because the higher height of the strings above the soundboard has increased the torque on the top, and caused the collapsing and twisting one sees in old instruments.¹⁴ So, action height has nothing to do with classical/ flamenco guitars of the 19th and early 20th century.

In terms of decoration, it is true that when it came to instruments for those of modest budget, decoration was simplified. Since most gypsy players fell into this category, their guitars tended to be plainer. However, this had no musical consequence whatsoever, so I would hesitate to use this criterion as any kind of indicator of musical style, but rather suggest it to be indicative of the economic situation of the original owner.

Finally, we are left with usage. And here, we have the crux of the matter. Simply stated, a flamenco guitar was any guitar one used for flamenco music. Similarly, a classical guitar was any guitar one used for classical music. There is plenty of evidence this was the case in the late 19th century. In the Fernando de Triana book, *Arte y Artistas Flamencos* published in 1935 there are 127 photographs of various 19th and early 20th century flamenco figuras. Of these, 35 depict guitars, either as props or actually being played. Where it can be determined with reasonable certainty, 14 of the photos show guitars with what appear to be dark wood sides and back, that is to say, not made of cypress. Of the other 21, 12 are so positioned so that no certain identification of the side and back material can be made and only 9 are clearly made of blond sides and back, almost all of them belonging to early 20th century players. Continuing along this line, the photo of Rafael Marín found in his *Método de guitarra (Flamenco) por música y cifra* clearly shows him playing a dark bodied guitar.¹⁵ Similar observations will result from a perusal of numerous historical photos contained within the *Diccionario Enciclopédico Ilustrado del Flamenco*.¹⁶

So why have cypress sides and back become the modern litmus test of the "flamenco" guitar? Simple economics. Of all the woods commonly used to produce fine quality art guitars in Spain, only cypress is native to the country. All of the other woods are imported, and consequently were traditionally more costly. Bear in mind that the entire cost of wood is contained within the sub-costs of logging the tree, converting it to timber, drying the timber, distributing and marketing it. It stands to reason that heavy hard timbers that are difficult to cut and must be transported across the sea are going to cost more than locally grown material that weighs less. Hence, compared to rosewoods, maples, mahogany and other woods, cypress was cheaper, and since the gypsy flamenco players were at the bottom of the food chain economically speaking, it stood to reason they generally would play cypress

guitars. Eventually by the turn of the century, this was codified to the point that makers such as José and Manuel Ramírez would offer cypress guitars intended for popular music, or flamenco in their catalogs, which are the earliest documentation I have found that actually distinguished guitars by materials in relation to their intended usage.¹⁷

Is there a difference between cypress and other woods? According to Romanillos, Torres made his famous paper maché guitar "...to prove his theories about the relative unimportance of the woods used for the back and ribs."¹⁸ This has been the traditional interpretation of this guitar for many years, repeated by many writers, but never verified in Torres' own words. I personally doubt that a maker of Torres' sensitivity would have been unaware of the obvious acoustical differences between cypress, the rosewoods, maple, mahogany, and other woods. Put another way, why bother to go to the expense to procure rarer and more expensive imported woods if local cypress would have been sufficient?

Origins of Flamenco

Now that I have established that the 19th century Andalusian Torres model is a mathematically definable model of one singular concept equally useful to any category of guitarist of the era, let's look at another uniquely Andalusian phenomena, the art of flamenco. Contrary to popular belief, it is not that old. The first mention of the word "flamenco" in relation to the Gypsies and their music comes from an Englishman, George Borrow who mentions in 1843 that the Andalusian gypsies had recently taken to calling themselves flamencos.¹⁹ Confirming this application of the term are the labels of at least 3 guitars made by Juan Perfumo of Cádiz dated 1844, 1846, and 1847 respectively²⁰ bearing the address of Calle de Flamencos, al salir a la calle Nueva No. 197. Of course, as many of you are aware, in Spanish the word "flamenco" also means "Flemish." It also refers to the familiar pink bird of Florida which we call the flamingo, a pronunciation that has been frequently misapplied when referring to the musical art of Spain.

In the early 16th century, Spain was ruled by Charles V of Flanders, or as it is known today, the Netherlands. Around this time the term "flamenco" entered the common Spanish language (which Charles V did not speak), meaning "Flemish." The court of Charles V was known for wearing hot pink clothing under their sober black gowns, a complete break from the attire of the Reyes Católicos who had preceded them. When early 16th century Spanish explorers saw the famous birds in Florida, the colors reminded them of the Flemish king, and so the birds were dubbed "flamencos," which was corrupted to the English "flamingo."

The connection with Gypsies is much more obtuse and shrouded in mystery, with numerous wild theories

abounding. The important thing is that Gypsies did not begin commonly applying the term to themselves until the early to mid 19th century, as documented by Borrow in 1843, and by extension it follows that flamenco music (referring to the Andalusian Gypsy art form) could not have possibly existed prior to this time under that name. Obviously, music is a cultural universal, and each distinct cultural unit or identity preserves and transmits through succeeding generations their collective remembrance of musical style and culture. Preservation of musical culture can be oral, aural, and/or written.

Arrival of Gypsies in Spain

The first documented mention of Gypsies in Spain dates to 1425 when King Alphonsus V of Aragon intervened on behalf of Count Thomas of Little Egypt who was en route to Santiago de Compostela. Apparently the local *payos* (non-Gypsies) had stolen two of the Count's hunting hounds.²¹ Gypsies in Spain were divided by the 17th century writer Salazar of Mendoza into two distinct groups, those of "Egyptian" provenance, known for their horse dealing, and those of "Greek" provenance, known for blacksmithing.²² Even today, Spanish Gypsy society is hardly a homogenous entity, as there are several different economic and geopolitical entities.

The welcome mat for Gypsies began to wear thin during the reign of the Reyes Católicos, who in 1499 began the first of a series of anti-Gypsy edicts which specified increasingly harsh penalties for those who did not settle down to non-gypsy ways of life. There is neither space nor time to cover the specifics of official government attempts to exterminate Gypsies between 1499 and the present era, but I have summarized the low points in figure 5.²³

One of the indirect outcomes of this official policy of genocide was the identification of certain Gypsy families, trades and places of domicile via census records, and official register accounts of Gypsy/governmental confrontations. For instance, the Bustamante, Rocamora, Montoya and Flores families received royal warrants from the court of Valladolid in 1602, 1620 and 1623 designating "Old Castilian" status for their extended families which specifically exempted them from the anti-Gypsy decrees.²⁴ This was given in appreciation of their 24 years of service in the military fighting the war in Flanders. These families became known as los flamencos in Alcalá la Real, Jaén Province of Andalusia where they settled. It is possible that this "flamenco" appellation was extended to all Andalusian gypsies around the early 19th century.

The Spanish census of 1784 and 1785 gives the surnames, names, ages, and occupations of all Gypsy heads of families residing in Spain at the time, as well as pertinent information about immediate family members living in the same household. Andalusia leads the list with

67% of the entire Spanish population of Gypsies, followed by the Levante region with 14%. Within Andalusia, the provinces with the largest populations were Cádiz, with 16.5%, Sevilla with 15%, Granada with 11.1%, Málaga with 9.1%, Almería with 6.4%, Córdoba with 4.1% Jaén with 3.8% and Huelva with 1% of the total Spanish Gypsy population. Within Sevilla and Cádiz province, 821 Gypsy families are concentrated within 16 smaller localities, including Sevilla, Jerez, Cádiz, Arcos Sanlúcar, Puerto de Santa María, Lebrija, Utrera, San Fernando (La Isla), Puerto Real, Ecija, Marchena, Medina Sidonia, Morón, Osuna, and Carmona.²⁵ These are all the towns considered to be the "cradle" of flamenco singing, the origin of the art form.

The year the 1785 census was taken, a Gypsy was born in Triana (a Gypsy *barrio* of Sevilla) who would later become known as "El Planeta" (1785-1860), who along with Tío Luís el de la Juliana shares the distinction of being the earliest documented singer of cante jondo. His *siguiriyas* are still sung today. He was the great-grandfather of the mother of Manolo Caracol (1909-1973), one of the greatest Gypsy cantaores of the modern era. This intimate familial connection with the figures of the past can be established for nearly every Gypsy flamenco singer alive today. The early recorded history of flamenco is completely dominated by a surprisingly small number of Gypsy families, whose names are recorded on the 1784 and 1785 census. It is my opinion that the creation of the flamenco art was therefore of uniquely Gypsy origin, which was drawn from musical survivals and elements present in Andalusia,²⁶ but reinterpreted through the uniquely Gypsy perspective.²⁷

Around the time George Borrow was evangelizing the Bible throughout southern Spain, many other Europeans were also traveling the region, looking to soak up the exotic sounds and flavors of Andalusia. Among them, the Russian composer Glinka, who spent time in Spain listening to Francisco Rodriguez "el Murciano" (1795-1848), a gypsy from the Albaicín of Granada. Glinka's account of el Murciano, along with the biography written by Mariano Vázquez Gómez (1831-1894) make El Murciano the earliest documented flamenco guitarist. José Juzenga Castellanos (1828-1891) published "Colección de aires populares para guitarra" in Madrid edited by J. Castro y Campos which contains 24 variations of a Malagueña by El Murciano.²⁸

Until the very early 19th century, Cante jondo or the flamenco art, was either a very closely guarded Gypsy art, or did not exist. There are simply no reliable first hand accounts of such music. It is entirely plausible that it was created within a very short time frame by a handful of gypsy families. The creation of "Bluegrass" music by Bill Monroe, or jazz manouche by Django Reinhardt immediately come to mind as examples of this type of spontaneous genre creation. On the other hand, some of

the most ancient cantes have references to the past Gypsy experience such as this *Tonás* sung by Antonio Mairena:

En el barrio de Triana	In the Barrio of Triana
se escuchaba en alta voz	A voice was loudly heard
Pena de la vida tiene	They are condemned to death
to(dos) aquel que sea Caló	all who are gypsies.

The Guitar Market in 19th Century Spain

As a result of the rising popularity of Gypsy flamenco among the general Spanish population, several significant milestones occurred which in my opinion are related. The first was the large scale commercialization of flamenco which began with what is known as the *Café Cantante* era (1847-1920). The second was the creation of the Torres model of guitar. Let's look at the second first. Torres began producing his models around 1852, only several years after the first *Cafés Cantantes* began to appear around Andalucía. Most authorities assume Torres was building the classical guitar for classical guitarists, but as I have already pointed out, this distinction did not even exist in Torres' day. So at best we can say he was making guitars for guitarists. All authorities agree Torres created an entirely new model, based on significant improvements of features already known in older Andalusian guitars. But why change if he was addressing the needs of the same classical guitarists who already had an established aesthetic and repertoire?

The introduction of the guitar to the Gypsy art of *cante jondo* as an instrument of accompaniment placed new demands on the instrument. Foremost, it needed more volume and projection than the brittle, mid-range oriented 19th century European models. Moreover, it needed to be percussive, aggressive, and slightly raspy, just like the vocal qualities of the great Gypsy *cantaores*. And it needed a deep bass to balance the high vocal ranges of the *cantaores*. Torres' model fit these needs perfectly. Torres' earliest surviving instruments date to 1854, and within a few years, he was already widely imitated by makers located in the region of Andalucía.

If we assume the orthodox explanation that the flamenco guitar is a variant of the classical guitar, then Andalucía must have been populated by an inordinate number of classical guitarists. In fact, compared to the rest of the world, 19th century Spain was rather underpopulated by those we might call "classical" guitarists today. For example, who were the top 10 classical guitarists of 19th century Andalucía? If you're typical, you'd probably say Francisco Tárrega and nine others. But wait! Tárrega wasn't even an Andalus! Well, let's see, there was Julián Arcas, Antonio Giménez Manjón, Juan Parga, Trinitario Huerta, Juan Valler, Antonio Cano, José María de Ciebra, Rogelio Molina, Manuel Sanz, and Pascual Roch. Um... well I'm sure there are more. After all, who were all those 19th century Andalusian guitar makers

making their guitars for? Exactly the question I asked myself.

To answer this question, I turned to the *Prat Diccionario* which is a kind of rosetta stone linking the 19th and 20th century. Prat, who was a Spaniard from Barcelona, emigrated to Buenos Aires, Argentina in 1909 and in 1934 published the most extensive listing of players and composers known. Not counting luthiers, there are 2,382 entries in the Prat dictionary. At considerable cost of time, I put it on a computer database cataloging entries by name, sex, location, profession, and other important aspects. I was shocked at the results. Of course there is a lot of fluff: ancient and royal personages who had some weak connection to the guitar thrown in for color, many dilettantes with listings unworthy of their importance, etc. But in the end I was surprised to find that out of 2,382 entries, only 418 are Spaniards of any era. If we narrow it down to 19th century Spaniards, there are 245 entries. And of the 19th century Andalusians, there are only 83 entries, of which 49 or more than half are listed as flamenco players. This from a writer who consistently referred to flamenco as that "vulgar popular art."

Perhaps you've heard of some of the 19th century flamenco guitarists: Julián Arcas (yes, he also played flamenco), Salvador Ballesteros, Luis Molina, Paco "el Murciano", El Maestro Patiño, Antonio Pérez, Paco "El Barbero", Paco Lucena, Juan Gandulla "Habichuela", Manuel Navarro Corzón "Patena", Paco Fandango,²⁹ Javier Molina, Román García Martínez, Antonio Moreno, Miguel Borrull, Luis Yance, Salvador "El Granaino", Rafael Marín, Antonio Montoya "El Faraón," not to mention Ramón Montoya. I'd venture to say some of these names are familiar to even those who are not aficionados, despite the fact that except for Paco "El Murciano" and Rafael Marín, not one of them left any written music behind.

In a similar vein, I made an informal listing of guitarmakers working in Spain between the very late 18th century and the beginning of the 20th century. I compiled this list from the Prat dictionary, exposition catalogs of guitar exhibits in Spain, and elsewhere, and of course my own archives of photographs and documentary information. Though not exhaustive by any means, I was able to identify by name, period and style 123 makers working in Spain. 23 are located in Madrid, 9 in Barcelona, 8 from miscellaneous northern and central Spanish cities, and the other 83 are located in Andalucía, with over half of these 83 concentrated in Cádiz, Sevilla, Granada and Málaga, the cities that as I pointed out earlier happen to have the largest populations of Gypsies in Spain.

Furthermore, the makers working in these Andalusian cities were the first to copy Torres' ideas, and created almost overnight the Andalusian school from

which our modern guitars are derived. Those makers farthest from Andalucía, especially those of Barcelona and some of the early Madrid builders tended to build guitars that were more 19th century European-like. However, as flamenco migrated toward Madrid, and later, Barcelona, the later 19th and early 20th century makers of these areas eventually abandoned the archaic European models for the Andalusian model of Torres, which by the beginning of the 20th century was ubiquitous throughout Spain.

Assuming I am correct in my assertion that the flamenco players constituted the largest share of the market demand, and were, consequently, the driving force behind the design innovations of Antonio Torres, then you might fairly ask, where did all these gypsy players get the money to order their guitars? To answer this, one must consider the musical occasions³⁰ of flamenco performance. Aside from the special occasions which traditionally were associated with certain flamenco cantes before they were placed in a commercial situation, in mid 19th century Spain there were two main avenues of employment for the professional flamenco: the *juerga* and the *Café Cantante*. The *juerga* was essentially a private party paid for by a wealthy Andalusian *señorito* who was usually a good aficionado of flamenco. *Juergas* usually had several intended functions of entertainment beyond just listening to Gypsies wail about their mothers and death. Prostitutes, gambling and just plain old hell-raising were also common.

The *Café Cantante* was a different matter. As a kind of local public theater, for the first time, flamenco artists were placed on a stage and expected to perform on schedule for a public who may or may not have understood or cared much for *cante jondo*. However, Gypsies were happy to have a job and they quickly discovered what worked and didn't work for the larger masses of Andalusians and Spaniards who frequented the *Cafés*. Soloists began to appear along with such crowd pleasing tricks as playing with socks and/or gloves on the hand.

During the period of 1847-1920 there were nearly 80 *Café Cantantes* in Spain.³¹ Sevilla led the list with 32, followed by Madrid (15), the rest being primarily in Andalucía. Earlier *Cafés* were all in the south; as time went by and flamenco migrated to other large cities, one finds *Cafés* in Barcelona, and even Bilbao. The important thing to bear in mind, is that each *Café* had to have at least 4 guitarists in house in order to have an audible show and sufficient manpower to cover the needs of the singers and dancers. And bear in mind, these *Café Cantante* gigs were at the minimum several nights a week of work. The typical classical guitarist would be doing well to play the same city once a year.

Without even considering private *juergas*, nonprofessional aficionados, or other market demand, the *Café*

Cantantes alone suggest a population of at least 300 full time professional flamenco guitarists. Assuming that the average guitar played professionally by a flamenco *tocaor* in a *Café Cantante* situation probably had a typical working life of 10-15 years maximum, then this alone would account for the lion's share of the market demand experienced by Spanish guitarmakers.

Before I discuss the dispersion of the Torres model to the rest of the world, I should touch on several key facts which augment my thesis. If you have studied Romanillos' biography of Torres you are probably aware that although he was born in Almería, he moved to Sevilla to make guitars. Romanillos offers several theories and suggestions as to why he made this move, the most plausible being that Sevilla was simply a bigger market with more opportunities for a budding guitarrero. But the same might have been said about Madrid, or Barcelona, where statistically speaking, there were more classical guitarists. Certainly, as Romanillos points out, there was a small community of Almerenses living in Sevilla, but I'd like to suggest that Sevilla was also the capital of flamenco at that time, having the largest gypsy population, the greatest number of *tablaos*, the leading player of both classical and flamenco (Julián Arcas), and easy access to wood importers. According to Romanillos, Torres met Arcas at a flamenco *juerga*, where they were introduced to each other by another flamenco guitarist who was playing a Torres guitar.³²

Much has been made of Tárrega's association with Torres, and rightfully so. Francisco Tárrega was the most important Spanish classical guitarist of the late 19th century. However, his influence on Torres was minimal at best. By the time Torres returned to Almería in 1869, to retire from guitar making, he had already developed all of his innovations and improvements. According to Romanillos, Tárrega acquired his first Torres somewhere between 1864 and 1869, and the instrument itself was made in 1864 by Torres as his own personal instrument. That is to say, it was made when Tárrega was 12 years old, and obviously had no input whatever into its design. Tárrega played this guitar for many years, and did not acquire a second Torres until 1883, followed by his final Torres of 1888. As Romanillos himself states, "The years spent in Sevilla represent the creative peak in Torres' work which was no doubt partly due to the environmental influences of Sevilla."³³ Tárrega's greatest contribution to Torres was to place his name on the lips of every aficionado of the classical guitar who wished to be a follower of the Tárrega School of guitar playing.

The Dispersion of the Torres Model

The dispersion of the Torres model throughout the world is nearly as fascinating a story as the hunt for its cultural roots. After the start of the *Café Cantante* period in 1847, the commercialization of flamenco followed

a new course, toward the larger metropolitan centers, especially Madrid and Barcelona. Analogous to the great migrations of Blues artists from the southern U.S. to Chicago and Detroit, the same happened with flamenco artists who left Andalucía for Madrid or Barcelona where new *Café Cantantes* were opening up to cater to the new wealthier crowd of aficionados. With the flamencos came the guitarmakers. Francisco González, José Ramírez I, and his brother Manuel, along with several others opened shops in Madrid around the late 19th century each striving to carry the crown of the Torres model into the 20th century. By universal acclaim, that honor went to Manuel Ramírez (b. Alhama de Aragón, 1864-1916), who was not only the best maker working in Madrid at the turn of the century, but also the maker responsible for training the excellent makers who would follow after his death to continue the Torres tradition.

In 1912 a young whippersnapper named Andrés Segovia wandered into Manuel Ramírez' shop looking to rent a guitar and left with a most extraordinary gift in the form of a recycled guitar which had been refused by Antonio Giménez Manjón.³⁴ Segovia took this guitar on his travels around the world beginning with tours outside of Spain in 1919, and by 1928 he had traveled most of the civilized world, bringing his Torres model Manuel Ramírez with him to the major musical capitals. In 1924 he met Hermann Hauser in Munich Germany, and allowed Hauser to take measurements of his Ramírez guitar. According to Segovia, it took Hauser 13 years to make the "Guitar of our Epoch" as Segovia called it.³⁵ While Hauser was not the first non-Spaniard to make Torres model guitars, he was certainly one of the best, as he brought a sense of refinement and detail that was entirely appropriate for the classical guitar. Totally ignorant of flamenco, Hauser was able to completely ignore this aspect of the instrument's roots, and redefine the guitar into a truly classical instrument.

It was around the turn of the century that the classical and flamenco guitar first became separate identities, described as such in written literature. The informal tradition of cheap cypress for the destitute gypsy players became formalized, and even wealthy players such as Ramón Montoya, Luis Yance, Javier Molina and others now played cypress guitars even though they could easily afford the more expensive rosewood models. Segovia's instrument, was made of rosewood for the sides and back, and as he introduced it to the rest of the world, it was the only variation considered by players. Certainly, a few flamenco players were making their way outside of Spain, but by this time the cypress=flamenco, rosewood=classical dichotomy had taken root not only in Spain but outside of Spain also.

It should be stressed that up unto around 1922, Segovia was intimately involved with the flamenco world, to the point he was one of the judges in the fa-

mous 1922 Cante Jondo contest held in Granada. First prize for the Cante was shared by El Tenazas, who had been a servant of Segovia's family when he was a young boy, and a very young Manolo Caracol, the great-great grandson of the Gypsy singer El Planeta whom I mentioned previously. During the contest, Segovia played *por soleares* while the Andalusian poet Federico García Lorca read his poem, "El Poema de los paisajes." Curiously, it was Segovia who was largely responsible for the negative attitudes held by many classical guitarists toward flamenco. One of his four stated goals in his mission to spread the classical guitar was to rescue the guitar from the "rudimentary folkloric divertissements of the flamenco." Though I'm not sure when this opinion first was postulated by Segovia, I suspect it began when the flamenco guitarists stopped playing in the *Café Cantantes* and *tablaos* and began playing solo recitals in the legitimate theaters.³⁶

By the mid 1930's the legendary Gypsy tocaor Ramón Montoya was concertizing throughout Europe and South America, appearing in such important halls as the Sala Pleyel in Paris and other major legitimate concert halls. Referring to the album of eight 78rpm records of flamenco solos recorded by Montoya in Paris in 1936, the music critic Emile Vuillermoz wrote in the November 12, 1936 edition of *Excelsior*:

All those who have had the opportunity to hear the incomparable Segovia know what can be expected of an instrument as rich as the guitar. From the purely musicological point of view, the efforts of Montoya are just as much an equal representation. Those interested in the genesis of these styles and the development of this popular art should very assiduously study this album which is very well presented and consists of an important collection.³⁷

If this quote from one of the leading critics of the era didn't put a bee in Segovia's bonnet, nothing would. Segovia enjoyed flamenco, as long as it knew it's place. Unfortunately his subsequent animosity toward flamenco which has been well documented in both writing and on video was also taken up by his followers and still lives on today in many subtle and unspoken ways.

Many have suggested that others besides Segovia should share the credit for dispersing the Andalusian Torres model throughout the rest of the world, and Segovia was hardly the first Spaniard to embark on world tours. Antonio Giménez Manjón, Trinitario Huerta, Julián Arcas, Luis T. Romero, Manuel Ferrer, Emilio Pujol, Miguel Llobet and many others far too numerous to list had extensive careers outside of Spain. Except for Latin America, however, the rest of the world seems to have ignored the Torres model until Segovia came along. Romanillos claims faking of Torres instruments was epidemic in Germany following the concert tours of Llobet

and Pujol in the 1920s,³⁸ but elsewhere, players and makers did not really embrace the Torres model until Segovia made it popular.

In Italy, the guitars of the Mozzani school continued to be very popular well into the '30s and '40s. In Russia, the Germanic style Scherzer/Stauffer model was popular well into the 20th century, as it was in northern Europe. In England, guitarists continued to play Panormo guitars under the assumption that they were Spanish models (they were, but Panormo guitars were based on the pre-Torres Spanish model). In America, pioneers like Vadah Olcott Bickford (who had studied with Manuel Ferrer), and William Foden played on German style instruments made by C. F. Martin Co. Despite the fact that Hermann Hauser had known Miguel Llobet for many years, he did not begin making the Andalucian Torres model until he met Segovia in 1924. His first efforts are surprising naive in attempting to capture the essence of the Spanish model, for Hauser never worked the wood as dangerously thin as the Spanish makers did. Yet he succeeded in creating a purely classical guitar which today is sought after as vigorously as Torres' guitars were after his death.

In Latin America, the dispersion of the Torres model could be the subject of a book. During the period of 1868-75 Spain endured a revolution, which may well have been instrumental in Torres' decision to retire and return to Almería in 1869. The people at the bottom of the social scale usually suffer the most during revolutions, and there is no doubt which end of the scale Gypsies were situated on. Faced with the prospect of even tougher times for his clientele, Torres must have thought retirement looked pretty good. Many other Andalucians, including trained guitar makers, emigrated at this time to Latin America, primarily to the Río de la Plata area (Buenos Aires, and Montevideo) and to Cuba. Francisco Nuñez, Manuel Domínguez, Juan and Rafael Galán, Salvador Ramírez, Daniel Lago Nuñez, Francisco Páges (Havana, Cuba), Antonio Emilio Pascual Viudes (trained by Manuel Ramírez), and many others came to America to seek their fortunes, and because the guitar was so highly esteemed, they prospered in America. In fact, by the beginning of the 20th century, most of the major guitar makers such as Enrique García (and later, his successor Francisco Simplicio), Manuel Ramírez (and later, his widow), Santos Hernández, Domingo Esteso, and even Hermann Hauser in the 1930s had formal arrangements to export special models to the major dealers of Latin America.³⁹ Many even had special labels printed just for their export models.

Some might reasonably suggest that Latin America was the driving force that forged the Torres model, rather than the classical players of Spain who were few and far between during the period of 1840-1869 when Torres formed his model. However, there is no evidence that

anyone in Latin America was in contact with Torres during this time, nor were his instruments even known in Latin America. It is true that there are records of guitar shipments from Spain during this era,⁴⁰ but the great wave of Latin American demand did not occur until after the Revolution of 1868-75, and by that time, the flamencos had already influenced the creation of the Torres Andalucian model. Torres unfortunately never lived long enough to see the tremendous demand and respect his instruments enjoyed during the first part of this century throughout the world.

Conclusion

It was no accident that the addition of the guitar to the flamenco art, and the creation of the Andalucian Torres model occurred at the same place and time in history. The primary driving force for the development of this model was a highly sophisticated and very difficult musical genre created by illiterate Gypsy musicians. That literate, classical musicians accepted the same model as their instrument showed a remarkable camaraderie that has unfortunately now vanished due to subtle and persistent anti-flamenquismo promoted by Segovia during the later part of his career. The genius of Torres, and his followers is that the model created nearly 150 years ago is still the basis for virtually all classical and flamenco guitars built throughout the world today. No other model of guitar has endured even remotely as long nor been as universally distributed as the basic Torres model. Modern makers continue to stand on the shoulders of Torres, and redefine his model for the needs of contemporary players, yet the basic structure as I have mathematically defined it remains unchanged.

End Notes

1. For more on this convoluted miss-application of terminology see my article on the English School in *Vintage Guitar* magazine, Vol. 9, No. 10, July 1995.

2. They note the back and "sidewalls" (sic) are made of Brazilian rosewood. No mention of other woods. One assumes Tárrega's favorite Torres guitar which has maple sides and back would be called a "flamenco" since it was blond. They are conspicuously narrow in their wood criteria, and their descriptions of various assembly methods is laughably incomplete, yet chock full of unvalidated value judgments (only spruce of 12-16 grains/inch is considered good). See the entries on pages 87 to 106 of Vol II.

3. Body length 48.5cm; upper bout 28cm; waist 24cm; and lower bout 37cm.

4. See the *Escuela de la Guitarra por don Dionisio Aguado*, published in 1825. Original copy in the Newberry Library of Chicago. Also see the *Neuvo Método para Guitarra* by Aguado published in 1843 and translated and edited by Brian Jeffery (Tecla Editions, page 8). I am indebted to Matanya Ophee for pointing out the discrepancy between the two editions.

5. See *Acoustic Guitar* magazine, May 1994, Page 122. This instrument is identical to one exhibited in the Exhibition of Spanish

Guitars at the Metropolitan Museum of Art, in New York City which was fraudulently labeled as a "Francisco Pages, La Habana, 1835." Frequently, the label is the least reliable piece of information in a guitar.

6. The French were the first to use the pin bridge, borrowing the idea from harp makers. See plate 19 of the Lutherie section of the *Encyclopédie* of Diderot. Mid-19th century French makers were using individual pins for saddles in their guitars. An example from the shop of Honoré Derazey is in the collection of the Smithsonian Institute of Washington D.C. Other bridge forms included moustache shapes, and other fanciful creations too numerous to include here.

7. The exact origins of fan strutting are not known, but many think it was introduced to 5-and-6 course guitars by makers in the Cádiz area in the late 18th century. Fixing precisely the date and location depends entirely on what you call fan strutting, because a rudimentary system of fan strutting can be found in late baroque lutes and guitars of various national schools. By 1800 6-course Spanish guitars were already being fitted with fairly sophisticated fan strutting designs.

8. José L. Romanillos, *Antonio de Torres, Guitar Maker: His Life & Work* (Dorset: (Element Books Ltd., 1987), page 81.

9. Stanley Sadie, editor, *The New Grove Dictionary of Musical Instruments* (New York: Macmillan Press Ltd., 1984) Vol. II, page 103.

10. "...the Flamenco guitar, the variant most closely related to the classic instrument." Jack Duarte, *Guitar Review* (New York: The Society of the Classic Guitar, 1961) No. 25, page 22.

11. See Domingo Prat, *Diccionario de Guitarristas y Guitarreros* (Buenos Aires: Romero y Fernández, 1934) pages 269-270. I restored this instrument in 1986-87, and later sold it to a Japanese collector.

12. I am in possession of copies of complete catalogs of both Manuel and José Ramírez which were published around 1912, and 1900 respectively.

13. R. E. Bruné, *Restoration Report: Antonio Torres 1884 #71* (Evanston, 1987) page 6. I also address the issue of neck angle, which is commensurate with action height in Spanish instruments. In this particular instrument, the neck angle was more appropriate for a flamenco guitar, even though it could never have been played as such with the extra strings.

14. Some have erroneously contributed this deterioration to the change from gut to nylon strings, claiming nylon strings have a greater tension, but just the opposite is true. Most monofilament nylon is 1.08 grams/cubic cm., whereas gut is 1.2 grams/ cubic cm., making gut the more massive of the two. Therefore, substituting identical diameters of nylon for gut actually results in approximately 10% less tension. However, raising the saddle increases the torque or mechanical advantage of the string tension, which on a very light thin-topped guitar is much more detrimental than changing the string tension by itself.

15. Rafael Marín, *Método de guitarra (Flamenco) por música y cifra* (Madrid: Dionisio Alvarez, 1902). This is one of the first references to the flamenco guitar (as opposed to the classical or concert guitar) that I have found in print to date.

16. José Blas Vega and Manuel Ríos Ruíz, *Diccionario Enciclopédico Ilustrado del Flamenco*, (Madrid: Editorial Cinterco, S.L., 1988). Vol. 1 and 2.

17. Even this was not written in stone. In my personal collection I have a Manuel Ramírez Ca. 1912-1916 which according to the catalog specifications is his Model 26 flamenco with cypress sides and back. However, the guitar was made for export to Romero Agromayor

y Cia. of Buenos Aires, Argentina, where flamenco was a foreign art. It was never fitted with a golpeador and was obviously intended for a popular player of modest means. It was fitted with the cheapest set of machines offered at the time.

18. José L. Romanillos, *Antonio de Torres Guitar Maker: His Life and Work* (Dorset: (Element Books Ltd., 1987) page 181.

19. George Borrow, *The Gypsies in Spain* (London: John Murray, 1843) page 42.

20. The 1844 instrument is described by Prat in his *Diccionario*, page 383, the 1846 instrument is owned by John McIlwain of Ontario, Canada, and the 1847 is described by Terry Usher in his article entitled "The Spanish Guitar in the 19th and 20th Centuries" in the *Journal of the Galpin Society*, Vol IX, 1956, Page 12, 13. All bear original labels with the same address.

21. Bernard Leblon, *Gypsies and Flamenco*, (Hatfield: University of Hertfordshire Press, 1995) page 27.

22. *Ibid*, page 28.

23. For additional details of the Gypsy experience see Leblon, *Ibid*, and also H. E. Wedeck, *Dictionary of Gypsy Life and Lore* (New York: Philosophical Library, 1973), pages 66, 126-128, 133, 195, 346, 347, 380, 412, 418-420, 422, 431.

24. At that time, the Spanish government did not wish to acknowledge Gypsies as a different race, and had begun to refer to them specifically as "new Castilians" as opposed to the general Spanish populace who were called "old Castilians."

25. Leblon, *Ibid*, pages 54-58.

26. For more on the nature of these existing musical survivals, including those of classical Arabic nature, and the etymology of the word "fandango" see my letters to the editor of *GFA Soundboard* Spring 1993 pp. 6-7, and *Soundboard*, Spring 1994 pp. 4-8.

27. Many learned authorities have investigated and written extensively about this question of the Gypsy/non Gypsy origins of flamenco. The political baggage of advocating one or the other side of the argument is enormous, and for the purposes of my argument regarding the cultural origins of the modern guitar, immaterial.

28. See Prat *Diccionario* page 221.

29. See Prat *Diccionario* page 232. Prat specifically mentions that he played a Torres guitar.

30. *Saetas* are normally sung to religious icons during Holy Week in Sevilla, *Marinetes* are sung by blacksmiths while working the forge, *Alboreás* are sung to the new bride immediately after showing proof of virginity, *Trilleras* are sung by farm workers thrashing and separating wheat, etc.

31. For specific names and locations, see the *Diccionario Enciclopédico Ilustrado del Flamenco*, Vol. 1, pages 128-130.

32. José Romanillos, *Ibid*, pages 12-18.

33. José Romanillos, *Ibid*, page 18

34. For more on this fascinating story and the remarkable guitar itself, see my article in *American Lutherie* No. 40. (Winter 1994), pp 18-23.

35. Andrés Segovia, "In Memoriam Hermann Hauser," letter published in *Guitar Review* No. 16, 1954. Like many of Segovia's assertions, caution is in order. I have copies of concert programs of New York, 1929, and Munich, 1933 which say Segovia is playing a Hauser guitar.

36. Despite widely held misconceptions to the contrary, flamenco has a history of solo playing extending right back to Paco "El Murciano" who left published guitar solos. Guitarists in the *tablaos* were categorized as either being *parás* or *palante*, these being Andalusian slang for "para atrás" (=in back) or "para adelante" (=in front), denoting whether a guitarist was either an accompanist only.

or soloist. The difference between today and the last century was that few flamenco guitarists would give an all solo individual recital on a stage. Solos in the Café Cantante era were generally a change of pace to give the singers and dancers some rest time, and amuse the customers with something different.

37. Blas Vega and Ríos Ruíz, *Ibid*, Vol. 2, page 508. My translation.

38. José Romanillos, *Ibid*, page 159.

39. I have photos of a Hauser label dated 1930 which states (in Spanish) that the instrument was made especially for the firm of Romero y Fernández of Buenos Aires.

40. In *Guitar Review* No 10, 1949 Carlos Vega mentions three cases of guitars shipped from Spain as reported by *El Nacional*. This occurred around the mid 19th century, but most likely these were cheap Valencian instruments. It is highly doubtful that Torres would have sold to merchants, given that he was temperamental about even selling to artists who came directly to him for an instrument.

Appendix: Spanish Edicts Against Gypsies

- 1499 Ferdinand V and Isabella I, joint monarchs of Aragón and Castile sign Spain's first anti-gypsy law giving Gypsies 60 days to settle permanently and take up a trade. Expulsion, slavery or slitting of the ears was the penalty for noncompliance.
- 1539 Charles I issues a new law requiring all Gypsies to settle permanently within 90 days or face either exile or service in the galleys for 6 years.
- 1560 Philip II signs a new law specifying that any Gypsy men caught travelling were to be sent to the galleys. Gypsy women wearing traditional costumes were to be whipped and condemned to banishment.
- 1586 All Gypsy merchants are required to have a notary's permission and a fixed place of residence.
- 1594 The States General of Castile proposed separating Gypsies by sex to prevent them from breeding, but after debate, decided to merely send all able bodied men to the galleys.
- 1610 Along with the general expulsion of Moors, it was proposed to include Gypsies, but after disagreements within the Corte it was agreed they should be dispersed among cities of more than 1,000 inhabitants and forbidden to engage in their customs and language.
- 1633 Philip IV signed a law decreeing that Gypsies were not considered by the state to be a sepa-

rate race, and therefore, were banned from speaking a language or wearing a costume different from Spaniards. Horse dealing specifically forbidden. Article 2 forbid even uttering the word Gypsy, and their entertainments (i.e. music) were forbidden. The penalty for Gypsies leaving their place of residence was slavery for life. Any Gypsies caught with a weapon were sentenced to eight years in the galleys.

- 1643 At the suggestion of Pedro de Villalobos, Dean of faculty of Salamanca University, the traditional right of sanctuary was repealed for Gypsies.
- 1695 Numerous updates of the 1633 laws were passed by Charles II requiring a census of all Gypsies, forbidding them from owning or using livestock, directing them to fieldwork occupations only, and banning firearms. Gypsies are forbidden to speak their language.
- 1717 Penalties for infractions of the 1695 laws are spelled out, and blacksmithing is added to the list of acceptable occupations. Forty one cities are named as the only authorized places of Gypsy residence.
- 1745 Any Gypsy absent from his residence is considered a bandit to be shot on sight without due process of law. Thirty four additional cities are added to the original list of 1717, and the census called for in 1717 was undertaken.
- 1749 In cooperation with the Bishop of Olveido, King Ferdinand VI authorized the mass detainment of all Gypsies, with either death penalties, or forced labor for those arrested. For the first time, local authorities objected on behalf of many of the settled Gypsy families who held important trade occupations, and owned property in their towns.
- 1763 Charles III issues a general release for all rounded up in the 1749 decree.
- 1783 Charles III decrees that the Gypsies are not so by origin nor nature. He decrees that the words Gypsy and "New Castillian" are grave insults which are not to be uttered, and that all trades should now be opened to any ex Gypsies. Any who persist in calling themselves Gypsies will be branded with a red hot iron. Death is prescribed for the second offense. Gypsies are forbidden from wandering or using their language.

Richard Brune's Corrections to the article, The Cultural Origins Of The Modern Guitar:

In the schematic diagram on page 10 of the guitar, there is a mistake of omission in the Width (W 1, 2, 3) proportions, which should be corrected to the following:

$$A + B = 1$$

$$W1 = .56$$

$$W2 = .50$$

$$W3 = .73$$

$$A/B = 60/40$$

Also, on the diagram of the bridge proportions, the end of the bridge should have "1" to indicate the width of the bridge. This was lost when they cropped the drawing for the article.

The only other comment/correction was from Matanya Ophee who pointed out (correctly) that Domingo Prat was a Catalan, not a Spaniard, as I wrote in the article. I knew this, but figured most readers would not understand the distinction, unless they were Catalan or Spanish.