Harpsichord & fortepiano

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INTERVIEW WITH PAUL IRVIN

By Richard Troeger

H & F: When did you start as an instrument maker?
PI: In 1970 I made a harpsichord from a kit for a girlfriend who played piano and flute. After teaching in the Chicago ghetto for seven years I felt I wasn't using my education enough, so I quit and started to try to figure out what else to do. While I was trying to work that out, a later girlfriend wanted to learn harpsichord as a beginner, so I ordered another kit from a lesser-known builder. When it came it was such a poor design, with warped, mismatched, non-fitting parts and a worm-eaten pinblock that it seemed not worth trying to assemble. So in 1976, with a re-reading of Frank Hubbard's book and a large sheet of paper, I designed a traverso spinet and made that from scratch. Curiosity about alternate design choices (not taken with that first instrument) led me to designing and making some small, portable spinets. These caught some people's attention, and my next career had found me.

H & F: What have you emphasized as an active maker?
PI: I had started with spinets because I thought they were an efficient form, but I knew that more could be done with them sound-wise than what I had heard. There was not much information on Italian spinets at that time, but I thought that such a light-weight approach would be convenient for people who needed to transport an instrument for playing. It was also a good size to make in my apartment workshop as I learned about harpsichord building.

After a period of making instruments in various forms and with various woods, veneering, and marquetry (I found beautiful wood much more interesting than paint) I was becoming aware that the period in the process that I really looked forward to was from when the first sound came from the instrument until it had its full voice. My emphasis in making shifted permanently after an incident in the early 1980s at a keyboard conference I attended. I was exhibiting some instruments in a room shared with three or four other makers. While alone in the room (everybody else was attending another session) I heard a tapping sound progressing down the hall toward this exhibit room. A white cane entered the room and the woman using it found her way through the instruments to a chair in front of one of them and played a while on it. Sensing me there, she said, "I've been to all the instruments at this conference and people tell me that they are gorgeous. I wouldn't know about that, but I do know that for me this instrument has the most versatile and musical sound here." She went on to explain and demonstrate what she was referring to. I realized that while all the harpsichords were beautiful to look at, they were not all equally musical instruments. From that point, my goal became to make keyboard instruments that a blind person would find beautiful.

H & F: Where do you stand on so-called "copies" of antique instruments?
PI: The concept of "copying" is a great place to start for the purpose of trying to recapture antique sound, but its potential is largely wasted when the copying does not go sufficiently beyond visual considerations of construction and materials. If this approach were sufficient to recapture antique sound, then any competent copy of an antique model would sound like the original and also like any other copy of it, and they blatantly do not. If musical results were so easily reproduced by such visual copying, then

all competent luthiers would achieve Stradivari's sound by copying an antique Stradivarius. They don't and can't, because vibrations, musical or otherwise, are a function of mass and stiffness that cannot be evaluated visually, but must be felt, measured, and finally judged by sound, not appearances. The factors that separate Stradivarius look-alikes from Stradivarius sound-alikes are far more subtle. How various parts vibrate in relation to each other, cancelling, enhancing, and passing energy back and forth cannot be detected by the eyes.

There has been a huge amount of study and publication about the vibrations and interactions in the modern piano. While it is sad that several centuries' worth of accumulated practical knowledge of such things in early keyboards has been lost, all the parts and principles still exist to experiment with and rediscover the consequences of various details and approaches.

It is tempting to attribute the difference in sound between two instruments to obvious differences in appearance, but unless most of the other possible factors can be controlled for (soundboard stiffness and distributed masses; scaling and pitch level; specific stringing material and sizes used; bridge and nut pin material, dimensions and installation approaches; jack geometry and the voicing approaches they allow; the shape, material and number of dampers in jacks; etc.), attributing the differences in sound to the basic design is like comparing apples and oranges. Or, the same as saying that apples taste differently from oranges because they look different.

Copying faithfully the dimensions, construction, and materials from a drawing of an antique keyboard will result in a recognisable harpsichord, clavichord or fortepiano. But it is very difficult for a maker to copy details that s/he doesn't notice, or notices but doesn't believe to be significant. Yet the consequences of these passed-over details may have considerable effects on the sound of the instrument -- as many makers of bowed strings, guitars, woodwinds, etc. are well aware. Many of these makers start ahead of early keyboard makers because they are quite sure of the sound characteristics they are trying to create and are aware of many of the factors they can manipulate to get them. Many early keyboard makers work guided only by their impressions from the sounds of harpsichords, clavichords, and fortepianos made or restored with approaches developed in modern times, along with the limiting expectation that the resulting sound is just a consequence of the basic design, despite all the considerable subtlety that is involved in fine violin, guitar, or even modern piano making.

H & F: What has been your trajectory in the last 20 years or so, since you've assembled quite a vast array of data and principles, if that last is the correct term?
PI: It wasn't too long after I starting making instruments and studying museum drawings and modern versions of antique keyboard instruments that I started to notice various construction and set-up techniques that did not seem to make sense on their own, along with significant differences between historical and modern approaches. More questions were added from reading some of the work of John Barnes, Grant O' Brien, Denzil Wraight, John Koster, Ed Kottick, etc. After quite a number of these accumulated, it seemed that what was bothering me about most of them boiled down to a conflict with the Efficiency Principle.

In any endeavour I am aware of, once a satisfactory result has been achieved, a fair amount of attention is paid to reduce the amount of effort, number of steps needed, and/or quantity of materials necessary to achieve the desired result. In other words, attention is continually paid to making the process as efficient as possible. Several factors (time, labour, cost, customers) reinforce this direction and those factors were present historically just as much as they are today. John Barnes' analysis of making a spinet with historical methods demonstrates this, as does Grant O'Brien's study of the Ruckers'

working processes. An efficient process means no unnecessary work is done to achieve the result, and, conversely, that all work that is performed is necessary to achieve that result.

However, it appeared that some of the historical making procedures involved unnecessary labour. For example, historical makers did significant extra work to get their plectra to be angled 5 to 20 degrees upward when the simpler-to-make horizontal mortises used by most modern harpsichord jacks, and even many modern copies of historical jacks, were much easier to produce and seemed to work just as well. Historical makers kept the inventory for, and used, up to five or six different sizes of pins on their bridges and nuts when most modern harpsichords, clavichords and historical copies seemed to work with just one or maybe two. Many historical jacks used two dampers when virtually all modern harpsichords and copies seemed to work with one. Historical makers did extra work to cut their dampers into curved or sloped shapes rather than use the simpler-to-make-and-fit rectangular dampers of typical 20th-century practice.

On the other hand, when making my first double-manual harpsichord, I could not figure out how the historical makers could have regulated the plucking stagger of three sets of jacks without bottom screws, when I was having a difficult time achieving it within the appropriate keydip even with those screws. Why did the historical makers keep the spacing so tight between close pairs of strings when that made it difficult to keep dampers on the strings in both on and off positions, and also allowed vibrating bass strings to buzz against each other? Why didn't they just spread them apart some more like modern harpsichords and most copies? How did they manage to voice their quill on their thumbnails with a penknife when we needed surgical blades and a fair amount of careful carving? Why were rather thin tangents used in historical clavichords rather than the thicker tangents that modern clavichords usually used, which provided more mass for striking the strings? Why did historical makers use thinner strings when their lengths were shorter than usual, rather than thicker ones in order to maintain the same tension as modern practices encouraged? Why did historical clavichord makers use leather or cord underneath the balance points of the keys when modern makers usually used easy felt washers? Why did harpsichord tongues kick back so much when most historical designs did not bother to fit restraints to prevent that? Why were historical plectra apparently kept consistently fairly short when modern practice typically favoured making them as long as possible in the treble and maybe a bit shorter in the bass?

I could find no evidence that people in the baroque era were less bright or clever than people nowadays, so I assumed that, with about 400 years of developing and experimenting with these instruments they would easily have also thought of the simpler, less-work, less-inventory approaches developed for use in modern harpsichords and copies over about 50 years. The fact that historical makers did not use these approaches suggested to me that these were not viewed as being more efficient. And the most likely explanation for that view seemed to be that those simpler ways did not produce the results intended historically. If they had, an historical maker who had chosen to use them would have gained a labour cost reduction advantage in the market place and everybody would have shifted in that direction. Consequently, in accordance with the Efficiency Principle, the seemingly extra work of the historical practices must have been viewed as necessary to achieve the sound and playing characteristics desired historically.

Having reached that conclusion, in the late 1980s I started incorporating various different historical set-up approaches in my work to try to determine what differences they made.

Some factors seemed to have more than one consequence, and some characteristics were affected by several factors. Some changes gave appreciable benefits immediately, while other changes needed additional factors in place before the consequences for their use became more obvious. For me, the sound characteristics of the wire from the first modern recreation of historical phosphorus-iron by Stephen Birkett a few years ago really helped to coalesce many of these factors into a specific sound ideal.

H & F: A friend of mine, Prof. Pekka Vapaavouri, once observed to me that after a clavichord is nominally completed comes the moment from which, by juggling details, you find out what its real tonal capabilities are. He understands the timbral variations, alteration of sustain and touch and so forth, that come about with, for example, choices of listing cloth material and its arrangement. (In fact, you and I collaborated on an article on that subject.) But your concern with many such details can produce striking improvements on instruments that have been around already for years--as I have heard for myself. Could you give a précis on what you've been observing, researching, and writing about?
PI: I completely agree with Pekka's view. Properly making and assembling all the elements of a design requires a great deal of care and skill, but that really only achieves the base for making a musical instrument....which is why in the last few years I've been less interested in making instruments from scratch. I find that there are a lot of well-made instruments already around that have the historically-expected basics in place, and that by adding and altering various detail factors to be more in line with historical practices, their sound will shift to one much more closely related to the sound characteristics of other baroque instruments, and that these qualities provide a wider range of resources for performing the music that was written for the instrument. They include musical qualities of a vocal nature that I believe were expected historically. I no longer feel so compelled to make musical instruments; I feel a stronger drive to make existing instruments more musical, for my own ears as well as the future of this field. This seems to be my third stage in this career.

From the investigations I've made so far, the majority of the historical set-up practices appear to be necessary in order to make it possible for particular musical characteristics to be produced, and these in turn produce benefits for action feel, and reduced tuning and regulation sensitivity. These musical characteristics involve a smoother, much less declamatory start that does not proclaim a metal string being plucked or struck, but involves a fully formed musical tone just appearing; an open vowel-like sound that is not pinched or divided into dipthong-like beginning and ending parts; a timbre that is more pitch-centred, clearer and focused due to a reduced proportion of high overtones; an impression of the tone gathering and blooming after its unobtrusive beginning; a longer sustain with a rate of decay which keeps the ear engaged with it until it just evaporates to nothing, in contrast to the type of sound that starts with a burst then quickly dies to a lower level and a slower rate of decay — which takes a conscious effort to hear and follow to its end.
Since many of these musical characteristics seem to also appear in historical instructions for singers, lutenists, violinists, etc., I feel that this type of keyboard sound is more likely to be what was expected and experienced in historical keyboards rather than the common modern easy identification of a harpsichord in a group recording by the rather metallic, percussive sounds heard. The change in musical characteristics also does wonders for making clavichords and fortepianos much more lyrical instruments, sharing obvious qualities with the modern piano (as should happen with an obvious progenitor), rather than the frequently dry separation of notes that most audiences find unattractive. (Sorry, that's what the polls show).

Having some idea of the various properties of

baroque sound (whether from the sound results of this more detailed copying approach or from careful listening to other good baroque instruments and well-trained baroque singers) makes it easier to track which among various set-up details influence which characteristics.

For instance, using increasingly heavier stringing on an instrument makes the beginning of the note louder and louder but with an increasingly faster drop off from the initial sound, creating a two-part sound, with less and less sustain. Experimenting with increasingly lighter and lighter stringing on an instrument will make a smoother and smoother beginning that blends into the continuing sound of the note and the sustain will get longer and longer, but eventually the sound will become rather ill-defined, weak, and incapable of producing enough energy to couple well with the mass of the instrument. Historical documents often refer to matching "the weight of the strings" to "the weight of the instrument" and I believe this refers to finding just the right gauges given the size and mass of an instrument's construction to enable the strings to trade energy back and forth, through the bridge and nut pins, and create a vocal sound that will resonate freely back and forth between strings and soundboard/case.

Harpsichords based on Italian and 17th-century French instruments, as well as clavichords, are frequently overstrung, either from assuming that later 18th-century Northern European stringing schedules apply to them (they don't), or from the desire for more loudness or presence. Earlier instruments across the board (strings, winds, brasses, kettle drums, singers, etc.) were less loud than later versions of those instruments. As more volume or projection was desired, designs changed to allow more power but still keep the essentially vocal, lyrical qualities that were desired and needed for the music. Late Swedish clavichords were much more heavily strung than earlier clavichords, but they were also larger, more massive and stiffer, which kept the balance and allowed similar musical characteristics to continue to be enjoyed. Various details of casework, stringing, jack design, even disposition, appear to indicate that the late 18th-century Kirckmans and Schudis were probably the most projecting of historical harpsichord designs since these features indicate stronger plucking, balanced by an increase in mass in order to maintain as much as possible of the other desired musical properties. Of course the fortepiano experienced a long series of increases in massiveness and stringing, all the way up to the modern piano.

There is a tendency by some people to string clavichords more heavily than historical evidence shows they were intended to be, apparently in order to make them louder, and this treatment will certainly make them "pop" more. However, while a Wagnerian singer could certainly perform Purcell lute songs more loudly than a baroque singer, I rather believe that much of the delicacy, nuance and colour expected from this music would be unrealised, as it is on such over-strung clavichords. The percussive sound the heavy stringing produces is far more suited for some modern music than for anything approaching an Empfindsamkeit nature. When an instrument is altered so far from historical practice that it loses the very musical properties needed to successfully realise the music written for it, one has to wonder about the purpose of presenting such an instrument as an historical one, rather than as an instrument altered for modern purposes.

I encountered a similar disconnect with a different keyboard last autumn when I saw what looked like a very good visual copy of a mid-18th-century fortepiano, only to be surprised by the type of sound that it made. It turned out that it was strung three to six sizes more heavily than the known gauges marked on the historical model! Not surprisingly, this doubling of tension on the soundboard produced a brighter sound by

significantly raising all the modal frequencies, spoiled the strings' ability to effectively couple energy with the soundboard for freer resonance, and created a pronounced beginning to the tone which diphthonged into a second sound with a different timbre and decay rate. The maker had "strung by ear" and the outcome was typically in line with 21st-century desires for loudness. Unfortunately that put it a long way from sounding like what the original maker achieved by stringing with 18th-century ears that knew the musical properties needed from the instrument.

I encountered another very good visual copy, this time of an Italian harpsichord made with jacks having horizontal plectra. The maker of the original, however, had intentionally made his jacks with plectra at a 20-degree angle, and I have found no way that horizontal plectra can achieve the proportion of vertical to horizontal displacement that a 20-degree plectrum can achieve. Consequently, there was little chance that the visual copy could really produce the sound of the original, although everybody who encountered it assumed that it did, since there was no maker stationed nearby (nor a plaque on the instrument) to tell them that it wasn't meant to reproduce the original sound, but just his own ideas.

As I mentioned before, the energy of the vibrating string needs to be traded back and forth with the soundboard through the bridge and nut pins; and as part of the energy path, the pins also need to have a particular relationship to the strings and soundboard to produce a smooth coupling of vibrations. The best size to make this happen to achieve the vocal, musical qualities desired appears to be within a rather small range, given the particular place in a specific instrument, although the sizes can range from 0.5mm to 1.9mm or more. While this is almost four times the difference in diameter, it represents a range of over 50 times the stiffness, which means a large difference in the amount of string energy that the extremes of this size range can handle. As with the string sizes, pin sizes also correlate somewhat with "weight of the instrument", but also appear to be influenced by the amount of pluck or strike the design is expected to use. So choices can get pretty complicated fairly quickly when making an instrument. Fortunately a few researchers and drawers of plans of antique keyboards have published pin measurements, and these help narrow down the sizes to experiment with. I wish there were a lot more data on these available, however.

In addition to considering the sizes of pins, there is also the question of the material. Most modern versions of early keyboard instruments, at least in the U.S., seem to use primarily one size, about 1.3mm/0.05" diameter, with some use of a 1.0mm/0.04" size for 4' choirs. Both these common sizes, however, are usually made of modern brass, which is a hard form that was not available historically. This different material increases the stiffness of these pins further. A similar difference occurs with historical iron pins versus the modern steel pins used in some designs. Additionally, just as two harder metals tapped together sound brighter than two softer metals tapped together, this effect also shows up in the hardness of the pins and their strings, and of the tangents against the strings in clavichords. While more brightness might be desirable in cymbals and triangles, it is not advantageous in melody and harmony instruments where sounds are expected to give a strong sense of pitch. In such cases the energy put into those very high overtones would be better used for pitch reinforcement; the very high overtones are out of tune with the pitch and create a blurry fuzz through which to try to distinguish musical lines.

Apart from how direct interactions involving strings can affect sound in early keyboards, I can give an example of another way that a well-intentioned modern contribution to keyboard making, inserted into an historical keyboard system, can seriously alter the modern perception

of an historical instrument. I believe using modern felt balance washers under clavichord keys can be a major contributing factor toward clavichords having such a feared reputation for being too small-voiced and/or difficult to play. The thick felt may be just the thing for the forces applied to organ and piano keys, but for clavichords they too often act as a cushion that absorbs finger energy, the energy of tangent impact, and the reflections of string vibration that should be passed to and kept in the string, so their presence diffuses the start of the tone and seems able to promote or exacerbate the infamous "chucking" ("blocking") that has made players avoid clavichords so much in modern times. Historical makers appear to have used materials that provided firm support to the key with only enough give to prevent clattering of the played key. In my experience, when this practice is copied it produces a clearer tone and can make the action easier to play. Martin Skowroneck and Peter Bavington have both noted the benefits of using leather under clavichord keys, although the fibre cord also used historically appears to provide similar benefits.

In fact, there are many small portable clavichords that exist today, made from kits or from scratch, which often exhibit a rather percussive sound of short duration mainly "suited for dance music". When the historical practices of balanced and softer stringing, appropriate pin and tangent sizes and materials, and key support are applied to them, they can transform into very lyrical, musical instruments, enjoyable to play, with quite enough sustain to be suitable for playing any appropriate music that fits their compasses.

We have many antique keyboards in museums and collections, but very few which have not undergone changes from maintenance during their working life, or from well-meaning restorations afterwards. In many of them, modern materials have replaced original strings, pins, quills, leather and cloth parts. Even if a few antiques survive with all their original parts, it would be difficult to know how much 200-600 years of aging might have affected the properties of various of the musically important materials through age: from the hardening of metals to drying out of leather and quill. Consequently, we have no example of sound from an antique instrument that we can trust with any known level of confidence as being the same as heard by historical listeners. If we knew what kind of sound we were aiming for, we could use any and all resources at hand to try to produce it. Without a direct tonal model as a criterion for our efforts, it seems to me that we are likelier to get closer to historical sound by copying all the possible known practices that historical makers found necessary to produce those sounds, rather than by assuming or hoping that using practices that they did not use will somehow produce historical results, or at least produce a good-enough sound dressed in historical clothes.

Comparing baroque sound ideals to the sounds that result from more thorough copying of keyboard musical details, noting what range of resources that sound might provide for playing the instrument's solo music, and exploring what musical possibilities that sound provides among and between other baroque instruments, can provide additional ways of confirming or rejecting the results produced by copying in this more detailed way.

I believe that if the intention of copying and using historical instruments is to reproduce the sounds of the past, then we need to pay more attention to the sound-affecting details the historical makers used in their work. If we follow through more closely on that intention and its consequences, we will achieve a closer matching of sound with the needs of the music, an expanded range of performance possibilities, and increased enjoyment for players and audience.