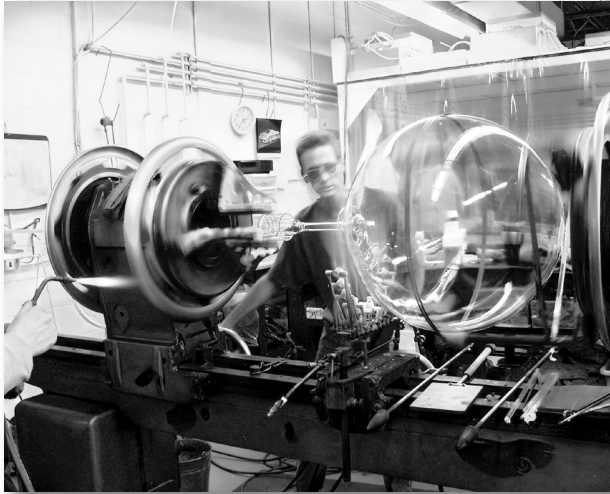


Glass Music World

SUMMER 2008

For pure sound, a clear choice

Local firm crafts glass harmonicas



Clockwise from left: Tom Hession at work at GFI; the exterior of GFI in Waltham, MA; Gerhard Finkenbeiner.

By Matthew Guerrieri, *Globe* Correspondent | August 26, 2007
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WALTHAM -- Bright yellow flames hiss from a half-moon of gas burners as Tom Hession fuses a bowl-shaped glass cap to a Pyrex chromatography column for a medical imaging company. As the clear cylinder spins lazily on a lathe, Hession and fellow glass blower Brendan Coffey name-drop clients.

"Jonathan Davis, from Korn, he bought one," Hession says. "Mark Mothersbaugh, the guy from Devo."

"Neil Young," Coffey prompts from the back of the shop.

"Yeah, Neil Young has one," Hession says.

They're not talking about medical instruments, but about one of the shop's other products, the glass harmonica. For 25 years, Waltham-based G. Finkenbeiner Inc. has been the leading manufacturer of the instrument, once a fashionable ornament of parlor and concert hall. The lanky, laconic Hession, the firm's head glass blower, proudly continues the tradition started by founder Gerhard Finkenbeiner, but is amused by the outsize ratio of publicity to production, compared with the shop's volume of scientific glass blowing.

"The harmonica has always been really a sidelight," Hession says, "but wherever I go in the country, there's always someone who knows we make them."

In 1761, Benjamin Franklin, visiting Europe, heard one Edward Delaval perform on the musical glasses -- 50 crystal wine glasses, mounted in a cabinet, tuned by being filled with varying amounts of water, and played by running a moistened finger around the rims, producing an icy, distant falsetto. (The British poet Thomas Gray had also heard Delaval, remarking, "I thought it was

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The Glass Harmonica: A Return from Obscurity

By Gerhard Finkenbeiner with Vera Meyer
Reprinted from the
Glass Music International Journal 1988

I. THE HISTORY OF GLASS MUSIC

People have been tapping and striking glass objects as a means of making music for over 600 years. It was not until the mid-1700's in Europe, however, that history records the first occurrences of music made by rubbing the rims of glass goblets with moistened fingers to produce various notes. The goblets or wine glasses were affixed firmly to a table, and then each was tuned precisely, with water, to a different pitch. The musician would sit in front of this assembly, making the glasses sing by moving a wet finger steadily and with light pressure around the rims. This arrangement was called the 'musical glasses,' and for a time it was quite the rage of high society in Europe.

When Benjamin Franklin was in Europe, as Ambassador to the Colonies, he chanced to hear a concert played on a set of 50 tuned water glasses. Charmed and captivated by the beautiful sounds being emitted from the glasses, he set out to design a more convenient and practical form of the instrument. His idea was to start out with already perfectly tuned glasses, doing away with the water tuning altogether. He thought to remove the stem and base from each glass and then slide them one by one, progressing from lowest note to highest, on a steel shaft. With a hole through the center of each glass, they could all be made to nestle quite comfortably within each other, close but not touching; the spindle could then be safely set into rotation, the glasses spinning securely along with it. Thus one would only need to touch the glass rims as they passed under one's wet fingers, and the instrument could be played much more like a piano; chords and faster musical passages would be easier to achieve, since one would not awkwardly

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PRESIDENTIAL NOTES



The feature article in this issue is one entitled, "For Pure Sound, A Clear Choice - Local Firm Crafts Glass Harmonicas," which appeared in the Boston Globe on August 26, 2007. It is an excellent article about G. Finkenbeiner, Inc. at the present time. We thank Tom and Diane Hession for making us aware of this article. Along with this, we have included a reprint of the article, "The Glass Harmonica: A Return from Obscurity," written by Gerhard Finkenbeiner with Vera Meyer, which originally appeared in the 1988 GMI Journal.

All members will find a dues request form for their 2008 dues included with their copy of this issue. We would

appreciate it if you would complete the form, include it with your dues payment, and mail them to Dean Shostak at the address shown on the form.

Also, included in this issue are the latest GMI member email address and website listings. Please review these listings and send any additions or changes to me: gmpres@verizon.net or Carlton Davenport, PO Box 228, Princeton, MA 01541.

Please send any articles, or suggestions for articles, to me at the above address and PLEASE send your GMI Happenings to Liz Mears, elizwndhil@aol.com. The number of inputs for this column has been shrinking lately.

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Michel Deneuve	http://www.micheldeneuve.com	Evelyn Glennie	http://www.evelyn.co.uk

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GMI Happenings

– By Liz Mears –

Summer and the rest of 2008 will hopefully include many glass performances by our members.

One of our newest members will have an album of his original works out on CD by the end of the year. **Eric Harry** wrote in April that he had just purchased an Armonica from G. Finkenbeiner, Inc. He is returning to glass music after a career performing in a couple of major Hollywood films and writing music for TV and radio commercials worldwide. Currently he is in the process of rebuilding his musical glass collection and redesigning his low bass glass-rotating table. Keep an eye out for that CD.

Vera Meyer writes, “Here’s an interesting gig I was hired to play for which made the Boston Globe”. “The congregation musters a robust turnout on a spring Sunday, its members packing the rented room at Longy School of Music in Cambridge. Some come outfitted in their Sunday best, while others sport a casual look. Lacking an organist, they enjoy lovely music by glass harmonica player Vera Meyer, her instrument a conical invention of Benjamin Franklin’s that makes music...”

An improvisation concert with the glass-sculptor, Florian Lechner, was among several glass music events performed by **Catherine Brisset**. In addition, she performed work for the Cristal Trio: “Sillages” by J.C. Adam Walrand, “En transparence” by J. Y. Bosseur, and “En verre et contre tout” by S. Beranger. And...she is also working with Bernard Baschet and Christian Maire to make a new Cristal.

Heading out to San Francisco in June, **Cecilia Brauer** will once again perform with her Armonica in “Lucia di Lammermoor”. Several libraries will welcome her performances, as well in 2008: the New York Public Library for the Performing Arts at Lincoln Center, the Providence Public Library and the Thrall Library in Middletown, New York, for the exhibit, “Benjamin Franklin...In Search of a Better World”.

In February, **Ann Stuart** and **Jonathan Stuart-Moore** played glasses for the opening celebration of an exhibit on Ben Franklin put together by the American Library Association, the National Endowment for the Humanities, and the Benjamin Franklin Tercentenary. The event was held at the large Cameron Village Library in Raleigh. They arranged an assortment of period music that Ben himself might have played on his Armonica, as well as, music of today that would have received Ben’s approval, including Ashokan Farewell. They were touched when a small boy retrieved four stuffed animals from the family car after the concert, set them up at the end of the glasses table and asked ever so politely, “Can you please play ‘Rudolph’ for them?” Of course, they did!

Barbara Mickle wrote, “Thank you for the GMI tribute to Bill’s life. Bill was a remarkable person and is very much missed by family, friends, and me. I still encounter strangers who, when they learn who I am, volunteer praise of Bill’s work as Franklin and his worth as a human being. It is wonderful to see him recognized by so many people and groups whose lives he had touched.”

Andrei Andrusov reported that our Glass Harpist from Saint Petersburg, Russia, **Alexander Lemeshev**,



Alexander Lemeshev of St. Petersburg, Russia

has been traveling a lot. He performs most often in Saint Petersburg and Moscow and, during the last year, also gave concerts in Almaty (Kazakhstan), Kiev (Ukraine), and in numerous cities in Russia. In May, Alexander performed at the 2nd Tarkovsky International Film Festival in Ivanovo. He played the glass harp and his colleague, Timofei, played glass pipes. He is working on a new disc and considering an opportunity to go to the US in September for a short performance.

Carlton Davenport received a sad note from GMI member **Monica Rogers**. Her mother, **Dot Rogers**, died peacefully at her home on April 24th after a long fight with cancer. Those who attended the Festival in Boston in 1997 will remember that Dot and Monica performed on colonial instruments in colonial clothing at the opening reception. She was a member of the Billerica Historical Society and performed 18th century music on the hammer dulcimer. Carlton extended our condolences to Monica on behalf of GMI.

Carlton also received a phone call from long time member, former GMI officer and Festival organizer, **Liz Brunelli**. Liz had a bad fall and spent quite a bit of time in the hospital, but is now back in her apartment. She is about to turn 89 and is able to stay in her apartment with her son close by and taking her to appointments and shopping for her. Carlton passed on GMI’s best wishes to her.

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— *FINKENBEINER* from page 1 —

a cherubim in a box.”)

Franklin improved the instrument, horizontally mounting a set of permanently-tuned glass cups -- the smaller the cup, the higher the pitch -- on an axle that revolved via a foot pedal. Instead of navigating a jungle of stemware, the player merely touched the compactly nested spinning edges. Franklin’s “armonica” became a runaway success. Mozart composed for it. Virtuosos toured with it.

The instrument was so popular that when the more familiar mouth organ was invented in the early 1800s, manufacturers conveniently appropriated the name, which had picked up an “h” along the way.

Finkenbeiner first saw a glass harmonica in a Paris museum in 1960. As a teenager in Germany, recruited into the Third Reich’s flying bomb factory, he had studied electronics and apprenticed with a master glass blower; after the war, he worked for the French Navy. An enthusiastic pianist and organist, Finkenbeiner pursued musical inventions on the side; a request from a priest friend prompted his creation of a two-foot-long glass bell, a thin quartz rod encased in a vacuum tube. Struck by a tiny hammer and amplified 10,000 times, the sound uncannily imitates a heavy church bell.

In the 1960s, Finkenbeiner moved to the United States and opened his shop in Waltham, producing custom glass for laboratories and electronics manufacturers -- and glass bells. Inspired by the discarded ends of quartz furnace tubes used in making semiconductors, Finkenbeiner finally designed and built his first glass harmonica in the early 1980s, and set about singlehandedly creating a market for them.

He continued manufacturing and proselytizing for the instrument until his disappearance in 1999: an avid pilot who often delivered his products across the country in person, Finkenbeiner took off from Norwood Memorial Airport on a May afternoon and was never seen again.

Harmony and healing

Turning from the chromatograph to the harmonica, Hession loads a General Electric type 214 quartz glass tube onto the lathe. Hession says that the purity and evenness of the tubes, a high-quality industry standard, are ideal for making harmonica cups: fluctuations in the chemical composition or the thickness of the glass walls can produce a “wah-wah” overtone, distracting from the harmonica’s pure sound.

Quality isn’t cheap -- Finkenbeiner harmonicas start at around \$7,000, the price escalating as more cups (and range) are added. In an upstairs storeroom stacked with cups (Hession uses spare time to blow extras, maintaining stock for when orders come in), Coffey displays an unusually large, low-pitched example.

“This cup alone would probably cost around \$1,500 to \$2,000,” he figures, “between the cost of the quartz, the hydrogen” -- used to fuel the required 2,000-degree-centigrade flame -- “and the labor.”

The price and scarcity -- only around 200 instruments have come out of the shop -- attracts collectors of expensive curiosities. Office manager Diane Hession, Tom’s wife, once got a call from the Sultan of Oman.

“I thought it was a prank -- and he didn’t speak English very well, so at first he sounded kind of rude,” she remembers. “‘I want a glass harmonica,’ he said, ‘the best one you have on the shelf.’ We were supposed to bring it to Logan Airport, where his plane was waiting to pick it up.” It was an extravagant wedding present for a musically-inclined bride.

Normally, harmonicas are custom-built to order, but there happened to be an extra one in the shop for the sultan. “I only wish it had been one of our \$40,000 models,” she laughs.

Another market has been practitioners of New Age and holistic vibrational healing techniques. It’s a big enough part of the business that Coffey knows the lingo. He points out a compact, one-octave model: “That’s probably for a healer,” he says. “They’ll sometimes ask for only seven cups -- just enough to open up the chakras.”

It recalls the instrument’s most infamous advocate, the 18th-century Austrian doctor (and -- small world -- patron of Mozart) Franz Anton Mesmer, who often enhanced his wealthy clients’ magnetism-based “therapy” with harmonica improvisations. Mesmer’s dubious reputation helped create a diabolical aura around the instrument: It was said to destroy the nerves of both player and listener.

Hession voices the rational opinion that players were being mildly poisoned by lead in the crystal bowls, gradually entering the bloodstream through the fingertips (not a problem with quartz). As for the alleged effect on the listener, even some contemporaries regarded the furor as simply effective marketing: In 1819, the writer E.T.A. Hoffmann wryly observed, “For any young lady of breeding, it would have been most ill-advised, as soon as the glasses were even touched, not to fall into a tolerably convincing swoon.”

Reflecting popular perception, the mad scene from Gaetano Donizetti’s 1835 opera “Lucia di Lammermoor,” famous for its high-wire soprano-flute duet, was originally scored with glass harmonica. Cecilia Brauer, who plays celesta and piano with the Metropolitan Opera Orchestra in New York, will perform the restored harmonica part for the Met’s new production of “Lucia” in September.

“It creates a spookier sound,” she says.

Brauer came to the harmonica backward, via a last-minute change on a 1990 concert by the Met Chamber Players. “They quickly had to substitute something,” she recalls, “and they chose the Mozart Quintet” K. 617, which contains a substantial harmonica part.

Brauer played it on the celesta -- a keyboard instrument with a high, metallic, bell-like timbre -- but six months later, she happened to see an interview with Finkenbeiner on television, and, remembering the Mozart, became curious. She eventually met Finkenbeiner and acquired her own instrument, and now performs in recital, with opera and ballet companies, and on the occasional film score -- one of a few dozen modern musicians resurrecting the harmonica’s artistic profile.

Brauer describes the delicate relationship between moistened finger and bowl: “If the water’s too hard, it’ll be a scratchy tone; if it’s too soft, it won’t sound at all. Then the temperature of your body might be wrong -- it’s very temperamental.”

But she loves the instrument’s handmade aspect. No two are exactly alike, which “gives it the personality.”

Carrying on

Back in the shop, Hession’s bowls begin to take shape. As flames -- white-hot, this time -- impart a fierce glow to the spinning quartz, Hession methodically builds up the tube’s walls, and soon the angular shoulders of a pair of cups emerge. Once the cups are hardened and scored apart, another glass blower, Shaun Conroy, grinds and polishes them, fine-tuning

continued on the next page

The Ciompi Quartet Gig

— By Ann Stuart —

Has anyone assembled 20 crystal glasses for a professional string quartet playing George Crumb's "Black Angels"? This task is what the Ciompi String Quartet, in residence at Duke, asked me to do this past fall for this piece, a classic in 20th century chamber music that uses amplified strings as well as glasses and other ancillary items. The musicians seemed totally perplexed as to how to find glasses having the pitches called for in the score. For me it was fun. Trips to the local gift shops and kitchen stores produced the glasses, and four very grateful string players were delighted when I produced for each musician a set taped down with aluminum silver tape in the style of the Stuart-Moore glasses. Jonathan had used his *Sibelius* software to print out labels for the notes in a large font. I must admit that the four sets looked elegant.

Filled with curiosity and enthusiasm, the first violinist, Eric Pritchard, rushed over to a barely-unpacked set of glasses and drew his bow across a rim. "It is an F-sharp!" he exclaimed in amazement. "Not quite," I countered. "The glass needs a little more water." Water? The horror of it near violins, viola and cello! He argued with me that it was close enough! I argued back: would he play his violin tuned "close enough?" Water it had to be, although all four musicians were happy to have me do the tuning.

The "Black Angels" quartet is a description of the horrors of the jungle warfare of the Vietnam war and it certainly succeeds, creating an insect-filled sound space permeated by cries that could be animal or human. The glasses enter the music at a moment of ethereal relief from this pandemonium, a section called "God Music," although in my prejudiced opinion their bowed sound is closer to insect than heaven. This movement may sound to some listeners like a lone mosquito (elec-



The Ciompi Quartet's setup for *Black Angels*. At right, first violinist Eric Pritchard talks to an audience member. Ann Stuart can be seen in the background.

tric cello) wandering in the air above an eerie background of millions of harmonizing insects (the bowed glasses), played by the two violinists and the violist. Despite its strange sounds, or perhaps because of them, the piece was highly successful and perhaps helped the Ciompi win the award for adventuresome programming at this year's annual meeting of Chamber Music America.

Jonathan's comment was: "You seem to have reached a tipping point in your local musical reputation." My thoughts were: "How delightful to be, ever so briefly, the center of attention of my local musical heroes, whom I usually see on a stage in their formal wear, and to watch them behaving like kids!"

the pitch, readying the final assembly.

Hession, who joined the company in 1979, sweeping floors while a student at Waltham Vocational School ("I never dreamed I'd be working here for the rest of my life," he says), has worked on every one of the firm's instruments, but only started blowing the cups after Finkenbeiner's disappearance. "The harmonica, that was his baby," he says.

Perhaps encouraged by the harmonica's eerie associations, conspiracy theories followed Finkenbeiner's disappearance; Hession dismisses them, blaming simply a heart attack or other sudden incapacitation.

"He always said that if something happened to him in the air," Hession recalls, "he would just turn on the autopilot and let the plane fly out to sea."

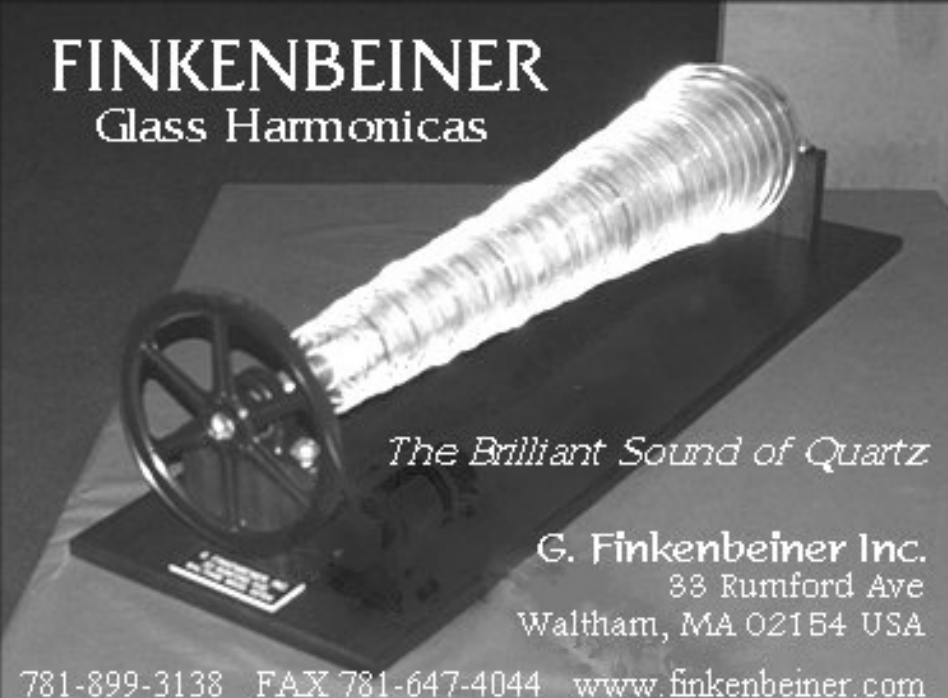
Eight years later, as the Hessions prepare to take ownership of the firm, they've been going through much of Finkenbeiner's legacy, the inventions and unfinished projects that still crowd corners of the storeroom.

"It's been hard," Diane Hession says. "He was like a father to us." But the shop -- and its unlikely musical progeny -- are now part of their legacy, too.

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have to coordinate turning one's finger around the rim of each separate glass.

Glassblowing was much more common in Franklin's time than it is now, and Franklin put many glassblowers to work on his ambitious project. For every 100 glasses that were blown, only one ended up being properly sized, tuned and useable, so the completion of an entire four-octave glass harmonica was an arduous task. Finally, in 1761, the goal was accomplished. In honor of the Italian word for harmony, Franklin named his invention the 'armonica,' or as it later came to be known, the 'glass harmonica'.

This instrument was popular throughout Europe for about 40 years. Our research indicates that there was a large glass harmonica factory in Germany with over 100 full-time employees building hundreds of instruments. Today, only a few of these instruments exist in museums around the world. Further research has also turned up over 300 original compositions for the glass harmonica by such eighteenth-century masters as Mozart and Beethoven, as well as by many lesser known composers.

After about 40 years, the instrument suddenly lost its popularity; it quite literally vanished from public view, presumably (from what we can gather) because people came to fear its powers. They believed that it caused insanity, nervous disorders, convulsions in dogs and cats, marital disputes, and even that it woke people from the dead. It was actually banned by police in some German communities. People so feared to touch it that a keyboard form of the instrument was devised: by striking a key, a spring would activate a wooden hammer covered with wet leather, which would reach out and make contact with the glass rim, producing a note in the same manner direct contact with the natural finger would have.

To what might one attribute all this craziness? One theory is that the lead in the type of glass used at the time would leach through the fingertips into the bloodstream, thus causing nerve damage. Another theory is that it sprang from the distrust and suspicion surrounding Franz Anton Mesmer, the psychologist from whose name the word 'mesmerize' was derived. He was a great lover of the glass harmonica and, in fact, used it in conjunction with his 'animal magnetism' healing cures to induce deeper states of hypnosis in his patients. Perhaps this use of the instrument was enough to give it a bad reputation, encouraging people to fear it and think it evil.

Regardless of this controversy, during its heyday the glass harmonica was the talk of the town, said by some to be more popular than the violin. Its sounds have been described as ethereal, haunting, ghostlike, mystical, angelic, coming from nowhere, pervading everywhere. Two of the leading virtuosos of the day were Marianne Kirchgaessner, a blind friend of Mozart's and Marianne Davies, Benjamin Franklin's niece.

II. THE CONTEMPORARY COUNTERPART

In 1960, I happened to see one of the original instruments in a museum in Paris. Being a master glassblower by vocation and a connoisseur of classical music by avocation, I immediately became curious about the possibility of building a similar instrument myself. The idea continued to interest me for over 20 years, but it was not until 1981 that I began the actual work and completed my first prototype model. Now, after over 150 years of obscurity, this fascinating instrument is back in production again, basically the same as it used to be, but also incorporating a few changes based on modern glass

manufacturing capabilities and technologies.

First, the foot-powered treadle used to turn the original spindle has been replaced by a silent 110-volt variable speed electric motor. Secondly, the type of glass now used is far superior to the old soda-lime glass previously used. After having experimented with all possible types of glass and judged the quality of sound they produce in a harmonica, I find quartz glass by far the best, being of superior resonance, followed by lead glass (crystal), soda-lime glass (regular household glass) and borosilicate glass (pyrex). The individual cups (or bells) are fashioned from semiconductor-grade fused quartz, comprised of 100% pure silica, the highest quality glass known. This is the type of glass I use daily in my shop for my more traditional work as a scientific glassblower.

I began the manufacturing process by mounting long tubes of this quartz glass on one of my industrial-sided glass lathes. For the lower notes, I chose tubes of larger diameters; for the higher notes, I use tubes of smaller diameters. Then by a combination of blowing and turning, I took the molten glass at temperatures around 2000 degrees Celsius, fabricating a series of elongated spheres along the entire length of the cylinder. Each of these spheres will later be sliced in half to produce two unrefined glass harmonica bells. After the crude cups are made from the glass cylinder, they are classified according to the note each is closest to in pitch. This is accomplished by holding each glass loosely in one's hand in front of an electronic musical stroboscope and then rapping it sharply with a stick to make it ring in its particular frequency. It would take years to complete a single harmonica if one tried to make one note at a time, precisely the shape and pitch. To circumvent this problem I use the random-method approach, making hundreds of cups of all shapes, sizes and tonal qualities. In this way, I acquire an unrefined supply of many potential middle C's of all different sizes, many C sharps, and D's, etc. It takes about a year to produce a stock of 500 cups at this rough stage of completion.

When the supply of cups is large enough, the real precision work begins, that of fine-tuning each cup to exact concert pitch. This is done in the following way: if the cup is slightly flat, its base gets ground on a glass grinder to diminish its mass — this makes the pitch higher. However, if the note is too sharp a different process, acid etching, is used to lower the pitch. By immersing the cup in a hydrofluoric acid bath for a precise amount of time, the wall thickness will be reduced — the acid literally eats it away. For example, if one were to take a middle C cup with a base diameter of 4 inches and immerse it in a 50% hydrofluoric acid solution for 20 minutes, .002 inches of wall thickness would be removed, and the former C note would now be a B, a half step lower. This explains why a glassblower has a difficult time producing a given note and a given diameter. A glassblower can control wall thickness to within, plus or minus, .001 inches; therefore, the note being made might be five notes or halftones higher or lower than the one needed, e.g. the next note in sequence on the glass harmonica currently under construction. Once again, it would be impossible to complete a harmonica making one note at a time.

With a large and readied supply of well-tuned notes of various sizes and diameters, the last step is easy. I have only to select the best fit from my large selection of each note when choosing which cups to slide one by one, side by side, on the spindle. As a buffer between the bare metal rod and the glass, and as a means of mounting the cups on the spindle securely, individual corks function ideally. After holes are drilled

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through their centers, the corks are slid onto the spindle; then the cups are slid directly on top of them. The corks are cut to fit perfectly, which keeps the cups tightly seated in the correct position on the spindle and also keeps them distinctly separated from one another. It is critical that the glasses do not touch each other; this insures that the vibration of each individual glass is free and unrestricted, with unimpeded rotation through the air. The trick is to get the glasses as close as possible without touching, perhaps with a 1/2 inch space between rims.

After the glass harmonica has been completely assembled for the specific range of notes desired, it is time to add one last touch of practicality combined with beauty. Using liquid gold, I paint a gold band along the inside border of the accidental notes — sharps and flats — to make them just as ebony wood marks the black keys on a piano. Baking these cups at high temperatures permanently fixes the gold to the glass. The gold bands serve as a visual aid to provide the player with reference points in the musical scale.

The glass harmonica is an idiophonic instrument — the elastic material capable of vibrating with a distinctive sound is the glass itself. It is different from other idiophones in that it is not struck percussively, but rubbed. The vibration is set in motion not by a blow but by the same principle we see acting in a violin, i.e. the sticking and slipping of the bow on the strings. The key element to this stick/slip principle is friction. With a violin bow, we use rosin for grip; with a glass harmonica, we use water on a well-washed finger. If the fingers are not 'squeaky clean,' i.e. if traces of body oils remain, the glasses will merely feel slippery under the touch — there

will be no firm grip established and consequently, there will be no clear sound produced. With friction at work, the finger is constantly sticking to the glass and slipping on it only when the momentum becomes great enough. This repeated action causes the vibration of the glass and the resultant note in the frequency of that vibration. The optimal speed of rotation is about 50 RPM. If the speed is too slow, an even and solid tone will not be produced; if it is too fast, the glasses will revolve too quickly to allow the finger to develop any grip at all, and there will be only slipping. Since the higher notes are smaller in diameter, they could use a slightly faster rate of rotation than the lower notes, to allow the glass rims to pass under the fingertips at the equivalent rate of speed.

As far as I know, no one has yet studied the acoustics of the glass harmonica from a purely scientific standpoint. People have told me the sound seems pure but that the harmonics are quite complex. It would be interesting to play a glass harmonica into an acoustic spectrum analyzer to see what might be revealed by this wave analysis. The sound of this instrument is often considered to be 'otherworldly' having a somewhat theremin-like quality. This is partly because the notes have no distinct attack and thus seem to develop out of nowhere and float and linger in the air.

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