GLASS MUSIC W·O·R·L·D

The Research Scene

Glasmeister solves optical problems

by Richard J. Weiss

In sniffing out stories for *OE Reports* one occasionally encounters a personality who outshines his scientific achievements. Gerhard Finkenbeiner, scientific glass blower par excellence, grew up during WWII in Konstanz, Germany, that city on the Bodensee virtually surrounded by Swiss territory. On a direct line for Allied bombing runs to Friedrichshafen 40 km away, it occasionally took a few stray bombs but its proximity to Switzerland probably spared the old city form serious damage.

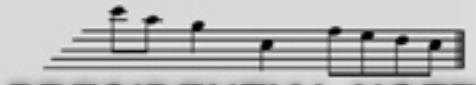
Only a teenager during the war, Finkenbeiner was selected for his aptitude in electronics and found himself immersed in the development of some of the advanced guidance technology for the V-1 'buzz' bombs. Able to receive both German and Swiss relayed BBC broadcasts he could only learn that 'both sides' were winning the war. Just 16 years old when the war ended, he was grabbed by the French Army, then engaged in snaring German scientific talent, and shipped off to Paris to continue his work and reveal to the French what he knew of German technology. He returned to Germany for a time and studied glass blowing under Germany's leading glasmeister at the Wertheim Glass Academy. He eventually ended up in Waltham, Massachusetts, in 1963 where his company is today so successful in the optical field that he only has to sit back and wait for orders!

Typical of the sort of task he is asked to perform for research labs is to mount quartz optical windows on a Dewar for low-temperature measurements. The quartz must be heated to 1700° C to obtain the vacuum-tight bond, but this invariably leaves a finely divided opaque film of micron-size crystallites that must be re-fused at 1300° C to restore optical clarity. To protect the central region of the window while performing this operation an additional quartz plate is employed as a protective cover. It is an achievement that Finkenbeiner can preserve the precise optical path over most of the surface of a quarter-wave plate (to within a few millimeters of the bonded edge).

When faced with the problem of producing a high transmission 'opaque' glass or quartz window capable of sustaining a vacuum, he developed the Finkenbeiner Bubble Window. The window is a strong hemispherical shell on 0.001 inch thick that provides 80 percent optical transmission at 5 μm and significant transmission even for a 600-kV electron beam. This thin bubble window is a work of art, relying on the ability of the glass blower to judge thickness by eyeball.

Because the optical transmission of quartz is affected by impurities, General Electric provides a raw material with impurity content measured in parts per million. When a laboratory complained that the tip of the heating torch sprayed unwanted metallic impurities on their quartz optical windows, Finkenbeiner fabricated an entire torch out of quartz!

*see **GLASMEISTER**, page 2*



PRESIDENTIAL NOTES

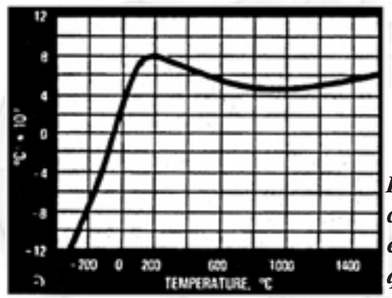
As promised, we are continuing our tributes to Gerhard Finkenbeiner in this issue of Glass Music World. Thanks again to all who have written in.

At the coming festival, we will have elections for officers of GMI. If you would like to nominate someone (or nominate yourself), please contact us! It would also be great to share information about prospective officers in the next GMW.

We have included an updated Philadelphia festival schedule in this issue. Please review it, and feel free to share more ideas we can use as we prepare for our first millenial gathering and celebration of glass music!

Glasmeister, *continued from page 1*

When he was approached to fabricate a vacuum-tight glass optical system with sapphire end-windows, he successfully solved the dual problems of bonding the sapphire to the glass as well as minimizing the stresses as a result of the coefficients of expansion differing by as much as a factor of 10. He achieved this by laying the sapphire window onto a special high-expansion borosilicate glass tube developed by Corning (7520) and heating the system in a quartz enclosure. The sapphire bonds to the borosilicate glass through the atomic diffusion of aluminum atoms into the glass and boron atoms into the sapphire since they both have the same chemical valence. The borosilicate tube is then bonded to Pyrex whose coefficient of expansion is intermediate between sapphire and glass. The glass tube is attached last.



Representative coefficient of expansion of fused quartz

The uncommon behavior of the coefficient of expansion of fused quartz gives rise to special problems in dealing with it. The figure shows the rapid drop to zero expansion near room temperature and the negative expansion values at lower temperatures. This is a rare phenomenon associated with materials that have strong covalently bonded chains (like Si-O2) and much weaker bonds between the chains. Consider a string of atoms connected by strong bonds and weakly connected with neighboring chains. As one heats the substance from low temperatures, the strong bonds remain rigid but transverse wavelike thermal excitations can be induced, shortening the end-to-end distances. (If you hold a string of pearls taught by the ends, any wave-like motion that one introduces must shorten the end to end distance.) Other substances exist with negative expansion coefficients, but quartz is the one that bedevils optical engineers.

Coming from a musical family, Finkenbeiner solved the problem of producing inexpensive church carillons by fabricating small quartz tubes with natural ringing frequencies and overtones corresponding to large metallic bells that are rung by activating a clapper. The quartz tube rotates and is sounded by a small hammer. The sound is electronically amplified and sent over loud speakers from the church steeple - few can recognize the difference. Quartz has a good ring to it because of its high sonic velocity and the lack of internal damping.

Ten years ago Finkenbeiner solved the problem of constructing and playing the Benjamin Franklin Glass Harmonica (invented in 1761), an instrument with a unique bell-like sound that captured the attention of Mozart and Beethoven, both of whom composed for it. It fell out of favor for 200 years, but is now gaining renewed popularity.

Dr. Richard G. Weiss, Avon, MA is a physicist, writer and authority on Benjamin Franklin.
This article originally appeared in OE Reports, *August 1995.*

TRIBUTES TO GERHARD FINKENBEINER

Ardis Satter-Leyman

It was nearing Christmas, 1983, when I flipped on the TV as I was preparing dinner one evening. Beautiful, unusual music caught my attention, and I went to watch and listen as a man played an instrument with which I was not familiar. Information of the player and the instrument had been given prior to his playing, so I was completely without knowledge of what I had seen and heard. Luckily, our local paper had an article about the instrument and Gerhard Finkenbeiner a short time later.

I contacted Gerhard having numerous questions which he kindly answered. After deciding to order a glass armonica, Gerhard had a practice model ready to be picked up in August, 1984. His generosity of himself, his time, and his expertise were matchless gifts to all who met him.

It has been my distinct privilege to acquaint countless people in So. California and also the Midwest with Ben Franklin's invention and to extol Gerhard's unusual craft.

I feel it was God's hand that led me to turn on the TV that evening!

for Gerhard

Angels on Watch

Encounters many, encounters few
It mattered not, strong friendships wrought
Innate, brilliant legacy grew
Imparting grace to all who sought

Angels on watch, as twilight stole
The last vestige of obscure path
Bearings lost was not a goal
Life's fragile, tenuous thread we grasp

Angels on watch, their promise kept
We the while are challenged to see
His selfless gifts were so adept
Touching lives for eternity

Angels on watch, who is not torn
As seasons come, as seasons go
The early harvest we all mourn
God's need for music sought his soul

Ardis Satter-Leyman
July 1999

Mikio Kozuka
Yokahama, Japan

It was in February '92 that the Corning Glass Co. introduced me to Gerhard Finkenbeiner. I had contacted them to find out about an historical glass harp owned by the firm. At the time I was directing a project for the Asahi Glass Co. in Japan, creating a glass park 100 miles from Tokyo. After reading Bruno Hoffman's description of glass harmonica in his book, I became convinced our museum should have one. After meeting Gerhard, I bought a 44 cup harmonica. At he time it arrived (Oct. '92) it was either the first or second glass harmonica ever to have appeared in Japan.

Gerhard also introduced us to Cecilia Brauer and Vera Meyer. Both of them wound up visiting us, giving us great playing instruction. After years of only faxes and phone calls, I finally met Gerhard in person in 1995 when I visited the U.S. with my daughter. At his factory, we found ourselves caught up in energetic conversation. We were both thrilled to have finally met! The next three days were fantastic. We found so much we had in common. I introduced him to my idea of building a glass pipe organ, which delighted him. He helped me to further develop this idea with great enthusiasm.

Looking at seven years of letters piled up, seven years of corresponding with him, I am filled with deep sorrow. I treasure my many memories of his great humanity and heartwarming kindness. Words cannot explain the admiration I feel for such a generous nobleminded person as Gerhard.

William Zeitler
Seattle, WA

Gerhard and his glass armonica has certainly turned my life on its head -- in fact, my life has completely changed forever. Alas, due to the fact that I live in Seattle, the only opportunity I had to spend personal time with him was when he, Thomas Bloch and I went out to lunch after the GMI convention in '97. We came back to Gerhard's shop and he generously let me go through his files on the glass armonica and make copies of articles and music. He was an absolutely charming and generous gentleman to me, it was a wonderful afternoon that I'm grateful to have had. I was eagerly looking forward to seeing him again at the GMI Festival 2000... I wish I could attend the memorial service planned for him -- but I will certainly be there in spirit, to pay homage to a great man. Thank you, Gerhard. I'll be eternally grateful to you.

please see ***TRIBUTES,*** *page 7*

profile:

William Wilde Zeitler

glass armonica musician

I have an extensive musical background: I started piano lessons when I was five, and went on to become a classically trained pianist and composer with a degree from the California Institute of the Arts. I also studied violin, classical guitar, flute and the organ, as well as other musical styles such as jazz. I've had numerous of my classical works published, and have also been the musical director for professional musical theater productions. Yet I had never even heard of the glass armonica, until in 1995 I came across an out-of-print recording of *Music by Mozart for the Glass Armonica*, performed by the late Bruno Hoffman. When I listened to that record, my musical career changed forever – I simply *had* to play and compose for the glass armonica myself.

"But first, I had to build my instrument: the quartz crystal cups were hand blown by Gerhard Finkenbeiner of Waltham, Massachusetts, and the cabinet and gold plated metal work was crafted by various artisans in Seattle, Washington. It took about a year to get it built. Then I had to teach myself to play it, since there aren't any teachers!

"But the expense and long effort have been more than worth it – although it's been the hardest instrument I've ever learned to play, it's also by far been the most rewarding. When I'm performing in public somewhere, where people who don't know me aren't expecting to hear a glass armonica, you can see them approaching the instrument with this look of complete awe and wonderment on their faces, as I'm playing. Even the most hardened, cynical souls with a "been everywhere, seen everything" kind of attitude in their faces – as I watch, I see that hard look turn into one of pure enchantment. That's really when I know I've chosen the right path for myself, because it's an incredible feeling to know that for just a little while, you've helped to open someone's eyes to the possibility that maybe they *haven't* got everything figured out, and that life really does hold beautiful surprises for us – and it can be around any corner!

"As I myself have been drawn into the spell of the glass armonica, it's also been changing the way I compose. Its elegant simplicity and beauty sound like they belong to a simpler and gentler world, and I think my music has become far more direct and "from the heart" since I started writing music with the glass armonica in mind. The fact that it's so unlike any other musical instrument I know of, has both inspired and compelled me to create a fresh musical style

Article Source: William Wilde Zeitler's website, **www.glassarmonica.com**

GMI Happenings

by Liz Brunelli

On Father's Day, June 20, 1999 a *"Tribute to Gerhard Finkenbeiner"* was presented by GMI at the Bethlehem Chapel, Brandeis University, Waltham, MA. Altar flowers were given in honor of Gerhard by GMI member **Mikio Kozuka**, Yokahama City, Japan. Reverend David Michael, Brandeis Catholic Chaplain, led the attendees in prayer. **William Meikle** as Dr. B. Franklin was Master of Ceremonies. Remarks were given by Bertrand Finkenbeiner, Colin & Virginia Steel, Alisa Nakashian-Holsberg, Timothy Nickerson, and **Elizabeth Brunelli**, GMI Vice President. The finale, "Christ Hall" by Thomas Bloch was sung by **Alisa Nakashian-Holsberg**, accompanied by **Thomas Bloch**, **Bernard Wisson** & **Tim Nickerson**.

A Memorial Service was held for **Gerhard Finkenbeiner** on August 14, 1999 at Saint Charles Church in Waltham, MA. Approximately 100 people attended. GMI members who performed for the service included **Carolinn Skyler**, **Alisa Nakashian-Holsberg**, **Tim Nickerson**, and **Vera Meyer**. Speakers included family members **Pascal**, **Stephane**, & **Bertrand Finkenbeiner**, and **Mrs. Marie-France Brush**.

The **Glass Art Society**'s 30th Annual Conference *"G.A.S. 2000: Bridge to the Future"* is scheduled to take place June 8-11, 2000 in Brooklyn, NY at Urban Glass and Long Island University. For more information, contact the **Glass Art Society** at 1305 Fourth Ave., #711, Seattle, WA 98101-2401, telephone 206-382-1305, fax 206-382-2630, or e-mail glassartsoc@earthlink.net.

On June 16, **Thomas Bloch**, **Dean Shostak** and **Peter Bennett** performed at the Corning Museum of Glass in Corning, NY as part of the opening for the new Glass Innovations Center.

Carolinn Skyler performed the Mozart Quintet on September 14, accompanied by the faculty of the Peabody Institute in Baltimore, MD. The concert received favorable review by Stephen Wigler, music critic for the Baltimore Sun. Carolinn's performance was given on her new 54 note Finkenbeiner Glass Harmonica. The instrument was completed in late May of this year by **Tim Nickerson** of G. Finkenbeiner, Inc. and features a two foot treadle with a range from C3 to F7.

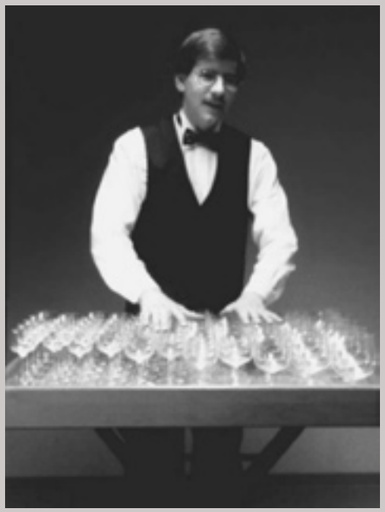
Dean and Valerie Shostak are pleased to announce the birth of their daughter **Abigail Jane**, on Septemeber 22d. Dean has a released a new album entitled "*Colonial Fair*." It is a recording for children with 'songs, stories, and riddles.'

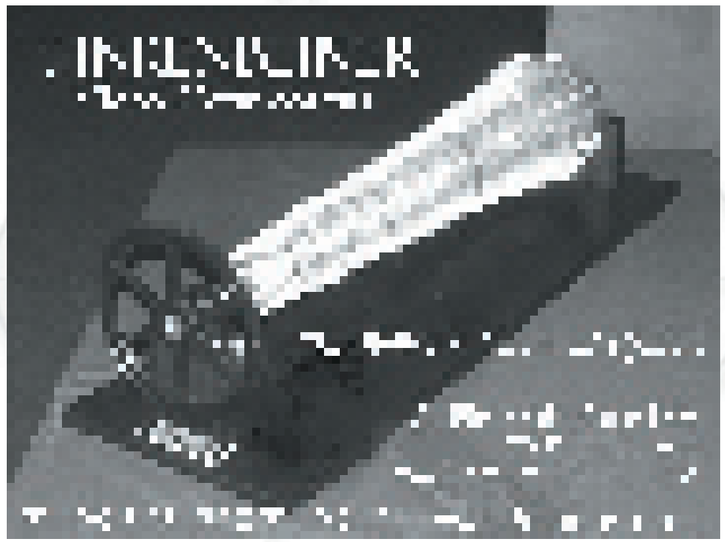
Thomas Bloch and **Christine Varden** are delighted to announce they were married at Belaye-en-Quercy, France, September 9th.

GMI member **Franck Vasseur** says 'hello from France.' He will be spending next summer touring with his musical glasses in Germany, as well as performing on luxury cruise ships.

Dr. Bejamin Franklin (**Ralph Archibold**) had the distinction of introducing the latest Mark Russel special which aired from Philadelphia this past October. The special was broadcast on National Public Broadcasting stations throughout the country.

Clemens Hoffinger joined GMI in 1996 and since then has been performing throughout Germany with his glass harp and verrophon. He recently visited the US for the first time, staying with his friend and glass music enthusiast **Michele Hogan** in New York City. He performed a long set of historical glass music at Cafe Mozart, and also performed an original peice for guitar and glass, as well as another new work for piano and glass, at a church recital in Manhattan. One of his treasured memories is of performing on a whim outside Lincoln Center at night. He enjoyed meeting **Carolynn Skyler** and **Tim Nickerson** while on a quick trip to Boston, and also enjoyed meeting **Cecilia Brauer** in New York (who performed *Lucia de Lammermoor* at the MET while he visited), and **Brien Engel** who was briefly in the NY area. All his glasses survived the trip! He carried them very CAREFULLY onto the plane with him.





The staff of G. Finkenbeiner, Inc. wishes to assure everyone the company is continuing production of its line of Finkenbeiner Glass Harmonicas. Tim Nickerson, who completed his apprenticeship under the supervision of the "Meister" Gerhard Finkenbeiner, will be responsible for overseeing the production and repair of glass harmonicas.

Tributes *from page 3*

There was an error in the printing of Vera Meyer's tribute in the last issue of GMW. It has therefore been reprinted.

Vera Meyer

I have known Gerhard for 16 years. It is easy to say he changed my life, affording me the opportunity to travel, meet new people and do the thing I love most, play my glass harmonica. Even without any of these things however, just knowing him would have been its own reward. I fell in love with glass music in 1983 and nothing less than the blessed hand of fate placed Gerhard nearby for me to discover him and his instrument-making shortly thereafter. I remember the day we first met in his shop like it was yesterday; I was incredibly awed by his unique work and his unique personality. To this day I treasure the swan he made me on that visit. I acquired one of the first instruments he ever built and then and there determined to be his avid supporter and promoter whenever I played.

We were a great team. What astounded me most about Gerhard was the absolutely limitless generosity he constantly displayed toward me personally, as well as his profound humility. His diminutive physical stature and soft-spoken nature truly belied the master artisan and genius that he was. We did lots of things together. He flew me to Jaffry and to Maine. He was always there in a flash whenever I needed any adjustments or repairs on my instrument. We had very memorable lunches where we talked in German and dreamed about what the next year would bring us in the way of developments with glass music. I will forever treasure the memories of having known him and of the experiences we shared.

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