The Glass Armonica

Magical Music and Extraordinary People

William Zeitler

www.glassarmonica.com

Contents

I Preface **9**

II The Magic of Glass **13**

III A Brief History of Glass (Through the Musically Playable Wineglass) **17**

Beginnings 19
Egypt 20
Rome 23
Venice 25
Northern Europe 29
Alchemy 30
England 34
The Rise of the British Empire 35
Fuel 36
Patents 37
Innovation In General 39
The Invention of Lead Glass 40
The Glass Tax 43
America 43

IV Glass Music Before Franklin **47**

Porcelain Instruments 49
The Japanese "Hi" 49

The Chinese “Fou” 49
The Chinese “Shui Chan” 50
The Indian “Jâlatharángini” 50
The Arabian “Tusut” 50
A Persian Porcelain Instrument 50
Early Glass Instruments 51
Gafurius 51
The Ambras Collection 53
’Buy My Fine Singing Glasses’ 53
The (Single) Musical Glass 54
Francis Bacon 56
Galileo 56
Athanasius Kircher 58
Musical Glasses 64
G.P. Harsdoerfer 64
C.W. Gluck 65
R. Pockrich 66
Ann Ford 73
E. Delaval 83
??? The Musical Glasses After Franklin 84
??? James Smith and his Musical Glasses 84
??? Captain Menzies and his Glass Harp 85
??? Hopkinson 86
Bruno Hoffmann and his Glass Harp 88
Various Musical Glasses Players 89
Mr. Cartwright 89
Cullen 91
J.E. Franklin 91
Other Musical Glasses Players 92

V Benjamin Franklin and the Glass Armonica 93
Franklin and Electricity 95
Franklin Invents the Glass Armonica 99
The Armonica: Franklin’s Lifelong Companion 106
Franklin Uses His Armonica for ’Healing’ 109
Attempts at Improving Franklin’s Invention 110
Water Trough 110
Keyboard Musical Glasses & Armonicas 112

VI Armonica Virtuosi 119

Marianne Davies . . . 121
P.J. Frick . . . 133
K.L. Roellig . . . 140
Letter 1 . . . 142
Letter 2 . . . 143
Letter 3 . . . 144
Letter 4 . . . 145
Letter 5 . . . 145
??? F. Reichardt . . . 149
Marianne Kirchgaessner . . . 149
??? Angelica Kaufman . . . 165

VII Composers And The Armonica 167

J.A. Schmittbauer . . . 169
J.A. Hasse . . . 169
J.G. Naumann . . . 171
W.A. Mozart . . . 172
L. van Beethoven . . . 176
Mendelssohn . . . 177
Donizetti . . . 178
??? Tchaikowsky . . . 178
??? Richard Strauss . . . 179
??? Saint-Saens . . . 179
??? Alban Berg . . . 179

VIII 'Creative' Uses of the Armonica 181

Franz Mesmer . . . 183
Early Years . . . 183
Mesmer and the Mozarts . . . 184
Animal Magnetism . . . 185
Maria Theresa von Paradis . . . 186
Paris . . . 189
Twilight . . . 197
Phantasmagoria . . . 198
The Magic Lantern . . . 198
E.G. Robertson . . . 199

IX The Armonica Waxes **205**
The Armonica in England . . . 207
The Armonica in Italy . . . 208
The Armonica in France . . . 213
The Armonica in The Holy Roman Empire . . . 216
The Armonica in Portugal . . . 222
??? The Armonica In America . . . 222

X ??? The Armonica Wanes **227**
Nerve Damage? . . . 230
Lead Poisoning? . . . 231
What We Now Know About Lead Poisoning . . . 231
??? Lead Poisoning Around 1800 . . . 232
??? Lead Poisoning and the Historical Armonica Players . . . 233
Why the Armonica *really* Disappeared . . . 233

XI Appendices **235**
Bibliography . . . 237
Primary . . . 237
Secondary . . . 242
Tertiary . . . 254
Fiction . . . 257
Science . . . 258
Historical Music for the Armonica . . . 259
Solo Works . . . 259
Chamber Music . . . 259
Orchestral Works . . . 260
Opera and Stage Music . . . 261
Noteworthy Works Currently Missing . . . 262
Correspondence To & From Franklin About the Armonica . . . 263
Correspondence To & From Thomas Jefferson About the Armonica . . . 279

List of Figures

1 Ann Ford 75
2 Lt.Gov.Gallstone 80
3 Lt.Gov.Gallstone—Detail of Ann Ford 81

Part I

Preface

I've been a musician since I was 5 years old, hold a B.F.A. from the California Institute of the Arts—and there was no mention of the 'glass armonica' in music history or anywhere else in all those studies. Then, in 1996, I happened to hear the Bruno Hoffman recording of the Mozart works for the glass armonica. "This is too beautiful—I have to do this." Thus began my Quest around the armonica.

Not only does the armonica have its own beautiful and unique musical voice, it also has an extraordinary history. It was invented by Benjamin Franklin. Mozart, Haydn, Beethoven and Tchaikowsky composed for it. Already it is very unique to have been invented by an Inventor (and Diplomat and Statesman and Businessman) as august as Benjamin Franklin, and it also has had music composed for it by equally august Composers. In fact, no other musical instrument holds that distinction.

But beyond its musical capabilities and unprecedented pedigree, an almost 'supernatural' dimension has been ascribed to it from the very beginning of its history—both for Good and for Ill. The power to heal has been ascribed to it—Franklin and Mesmer used it for healing; and simultaneously the power to injure: playing it wakes up the ghosts if you play it after midnight, players will suffer lead poisoning, nerve damage, and marital discord, and it even causes convulsions in your pets! I don't know of any other musical instrument that holds this distinction either—as dubious as it is!

I don't know what to make of all of this, so I present it all without comment in the pages that follow. Meanwhile, to me, Franklin's Armonica is at the very least an extraordinary and beautiful musical instrument, with its own marvelous and unique musical voice, which disappeared from use mostly because—we weren't ready for it yet. Technologically for certain, and perhaps culturally also. It was just too far ahead of its time. Perhaps now, on the 300th anniversary of Franklin's birth, we are finally ready for his exquisite and delicate musical flower. Time will tell.

An important note: some questions about glass musical instruments which simply can't be resolve by appealing to scholarly sources can be resolved by experiment. This is entirely in keeping with Franklin being an "Experimental Natural Philosopher". For example, the preeminent musical reference Grove's Dictionary of Music states that adding water to a wineglass raises the pitch. I invite the reader to test this for themselves in their own kitchen: you'll find that adding water lowers the pitch. In general, my philosophy in this book is to either cite a source, or an experiment the reader can perform for themselves, for every assertion. (Experiments the reader can perform for themselves are indicated by "Try it!")

I am terribly grateful to so many who have helped me along the way on my Armonica Quest: first would have to be my mother, who even when we had no money, saw to it that my music lessons continued anyway; Gerhard Finkenbeiner and Tim Nickerson for the glasses on my first instrument; Deborah Avery for her support as I was getting started; Dennis James for his helpful suggestions, Robert Sardello, Brett Peppe, Candace [???], Ken and Kay Leppell, and Sue Marro who were so supportive in a particularly dark stretch of my Quest, and so many others. But I am especially grateful to my manager and colleague Keith Richmond. This book simply would not be in your hands without his skillful management of the business aspects of my glass armonica career. And he's one of those best friends who—if you are lucky—you may have two or three in your lifetime. How great is that?

I'm acutely aware of the many shortcomings of this little book, and of the inevitability of errors in spite of all my efforts. I truly look forward to correcting and expanding the enxt edition.

william zeitler

January, 2006

Part II

The Magic of Glass

To see a world in a grain of sand. . .

- William Blake

Upon reflection, glass is really an extraordinary substance. When plastic-in that temperature range between solid and liquid-it can be manipulated as easily as clay by the potter, it can be cut with scissors like cloth, or drawn into threads thinner and stronger than silk. It can be rolled into plates, drawn into sheets, and poured or blown into molds. Its transparent optical qualities have made lenses possible. Think of the countless people who would have been 'too blind' to contribute to society without eyeglasses (including this author)-how many geniuses (such as Franklin) have needed eyeglasses, whose contributions would have been thwarted without them. In fact, the explosion of learning in the Renaissance may be due in part to spectacles, in wide use in the 15th century (about the time the printing press was invented), which added decades of reading to human life.[1]

And the optical properties of glass have opened both the infinitely large Cosmos (with telescopes) and the infinitely small realm of the microbe and smaller (with microscopes) to human view. Without glass, we would still believe that the sun revolved around the earth, and would still have no clue as to the cause of the Plague.

It's also impossible to imagine modern chemistry and medicine without glass: it is extremely chemically inert, making it possible for chemists to have test tubes and other apparatus that don't chemically react to their contents. Medical researchers have Petri dishes and other apparatus that are too inert for the bacteria and drugs under study to react with. And being transparent, scientists can see what's going on inside. (Perhaps using a microscope, with its glass lenses.) And glass is easy to clean, easy to seal, and easy to transform in shape. Nor would modern electronics have been possible without glass. The first generation of radio and television, as well as early computers-all used 'vacuum tubes', which were made of glass. High-end audio equipment still uses glass 'tubes'. Picture tubes of glass are still in wide use in televisions and computer monitors. Glass globes can withstand the pressure of the atmosphere when the air is removed, and glass is also an excellent electrical insulator.

[1] Mumford, L. Technics and Civilization, p.126

Or consider the simple windowpane-in your house and your car: glass lets the light in but keeps the elements out. Until the invention of plastics in very modern times there was no other choice but glass, and even today it is still generally the most economic choice. Imagine a house in northern climates before glass-your only light would be open windows that let in the elements, or candles.

And let's not forget the light bulb—incandescent, fluorescent, and neon.

And then there are the artistic uses of glass, from stained glass windows to incredible creations of glass—blown and otherwise—by millennia of artisans.

And as humanity inevitably adopts a more renewable economy, glass is likely to continue to play an important role: usually when substances (like plastic) are re-melted to be reused, they degrade. Glass, however, can be remelted and reused countless times without any measurable degradation.

And if all of that weren't enough, you can also make *music* with glass! As we shall see. . .

Part III

A Brief History of Glass (Through the Musically Playable Wineglass)

Beginnings

The origins of glass are lost in the misty origins of human civilization itself. Natural glass has existed since the beginnings of time, formed when certain types of rocks melt as a result of high-temperature phenomena such as volcanic eruptions, lightning strikes or the impact of meteorites, and then cool and solidify rapidly. Naturally occurring glass, such as obsidian, has been used since the Stone Age. Primitive tools chipped from natural volcanic glass appear to have been used since about 48,000 BCE.[1] Beads of glazed stone have been dated to at least 4000 BCE.[2]

The first account of the origins of glass was written by the Roman encyclopedist, Pliny the Elder (23-79 C.E.). (As Commander of the Roman Fleet, perished attempting to rescue survivors of the volcanic eruption of Vesuvius.[3]) In his Natural History Vol. 36 he relates:

> "There is a story that once a ship belonging to some traders in natural soda put in here and that they scattered along the shore to prepare a meal. Since, however, no stones suitable for supporting their cauldrons were forthcoming, they rested them on lumps of soda from their cargo. When these became heated and were completely mingled with the sand on the beach a strange translucent liquid flowed forth in streams; and this, it is said, was the origin of glass".[4]

Thus, according to Pliny, did humanity chance upon the recipe for making glass. Unfortunately, it is simply not possible to achieve the necessary heat to create glass with a campfire—a proper furnace is required, so Pliny's account is definitely fanciful.

Glass isn't made in Nature in a process that human beings can observe and imitate (like inside volcanoes). Manmade glass requires sand, and alkali (various choices for this), heated to temperatures that require a real furnace to achieve—expensive to build and operate. The ancient alchemist who was just trying combinations of materials in their furnace

[1] Hammesfahr, p.1
[2] Phillips, 11
[3] Pliny the Younger, Letter to Tacitus, Letter 6.16
[4] Pliny, 36:191, p. 151

to see what happened (and that could be hazardous), thus discovering glass, would have to be our first Extraordinary Person in the history of the glass armonica.[1]

Egypt

Man-made glass apparently originated in the pre-history of Eastern Mediterranean countries, perhaps Egypt. Mesopotamia seems to have had a flourishing glass industry around 2000 BCE, manufacturing non-transparent beads and other simple objects in fairly large quantities, with the occasional finely molded piece for the royal customer. [2]

During the reign of Tuthmosis III (1501–1447 BCE) Egypt invaded and conquered part of western Asia. Egypt's first glass factory was found dating from that period, suggesting that one of the spoils of war might have been skilled glass craftsmen. In any event, Egypt was a synonym for luxury and culture in the ancient world, and although Mesopotamian glass making continued to flourish, it was the Egyptians who required and paid for the finest skills and materials, making Egypt the glass making capitol of the time. In fact, the earliest glass vessels that can be dated with some certainty are three turquoise blue vases with the cartouche of King Thothmosis III.[3]

Similar specimens from this period indicate glass-making reached high standards of efficiency. Egyptian vessels of colored glass found ready markets in the Middle East countries. This naturally led to the spread of glass-making knowledge, practiced in other countries bordering the Mediterranean.

Then in the fourth century BCE, Alexander the Great conquered the known world, and founded Alexandria in 331 BCE. Alexandria became a center of ancient world, and glass making 'followed the money'.

[1] Even this is an oversimplification. For a thorough examination of ancient glassmaking technology, see Kurinsky.

[2] Phillips, Ency of Glass, p.20

[3] One in the British Museum, another in the Munich Antiquarium, and the third at the Metropolitan Museum of Art in New York. Phillips, p.11

Alexandrian glass products quickly captured export markets long been enjoyed by Egypt, and those exports reached as far as England and Scandinavia. [1] Apparently, Alexandrian glassmakers introduced their craft to Rome about the beginning of the Christian era.

It was about this time that we meet another of our Extraordinary People: an unknown crack-pot who had the crazy idea of taking a metal pipe, dipping one end of it into a pot of molten glass, and blowing. Mind you, glassblowing requires much hotter furnaces than other glass-working techniques. Furthermore, metal pipes were difficult to make and thus rare and expensive in ancient times. So our Extraordinary Person got their glass considerably hotter than was the norm, took their expensive metal pipe, stuck one end into the molten glass and blew a bubble. And humanity was forever transformed.

This technique was almost certainly invented in Syria in the first century of the Christian era. There is no way of knowing how this invention came about—this method is quite unlike any method employed before in glass—or in any other material then or since (for example: there is no such thing as 'bronze-blowing'). Glassblowing allowed the skilled artisan to create a far greater variety of glass objects in far less time than casting or other glass-making techniques. This unprecedented idea—blowing a bubble of molten glass—must easily qualify as one of humanity's Truly Great Inventions.

The nature of the ancient glassblowing pipe itself is an interesting question. The pipe needs to be able to not only stand the heat, but also the heat differential—at one end will be molten glass, the other end will be at room temperature. The pipe also has to be about 1.5 meters long (5 feet)—shorter than that and the glassblower will be burnt trying to get the end into the molten glass; longer than that and the pipe is unwieldy, especially with a big blob of heavy molten glass on one end. (You have to start with more glass on the end of the pipe than will end up in the finished piece.) Thus the pipe also has to be rather strong, both physically and thermally-it almost has to be metal to meet all these requirements.

Although glass melts at about 650C (1200F), it needs to be considerably hotter than barely-melted to be 'blow-able'. Furnaces in modern glass-

[1] Phillips, p. 11

blowing shops (with natural gas or propane fueled furnaces) currently keep the molten glass at about 1300C (2300F); ancient glassblowing shops (with wood-fueled furnaces) likely made do with lower temperatures. The Egyptians around 2500 BCE were making copper pipes to a diameter a little under 2” by taking a flat piece of copper, rolling it into a pipe shape, and hammering the seam closed.[1] Thus it’s clear that in ancient times they were capable of making, for example, a copper pipe that could have worked as a glassblowing pipe. Even in modern times, because molten glass is not only hot, but also corrosive, modern glassblowing pipes are expensive tools incorporating significant modern technology.

Curiously, although glass was known in India, China and Japan, they did virtually nothing to develop it. Glass technology has been a peculiarly Western pursuit until modern times. [2]

—

Glass Factoid: The first mention of glass in western literature (with the possible exception of the Bible, depending on whether you classify the Hebrew Scriptures prior to the Christian era as ’Western literature’) is in a speech by Cicero in 54 BCE in defense of Gaius Postumus at his trial:

> ‘Postumus’ ships were berthed in Puteoli and merchandise was talked about and seen. In reality, those goods were nothing more than cheap imitations made from paper, linen, and glass; and, although many ships were loaded with these, the whole lot together could not equal the debt.” [3]

—

Glass Factoid: Glass is mentioned in the (King James) Bible in eight places:

---

[1] Sahura, Plumbing & Mechanical, July 1989. The earliest cast iron pipe appeared around 1500 (Koeble, F. & Hogan, W., Cast Iron Soil Pipe and Fittings Handbook, Cast Iron Soil Pipe Institute, 1994). Commonly used metals of ancient times include: lead which melts at 330C, brass at 925C, copper at 1100C, iron at 1150C (and glass at 650C), the melting point of alloys is considerably more complex. Modern pipe making received its big impetus from the making of gun barrels.

[2] Macfarlane, A. & Martin, G., “A World of Glass”, Science Vol. 305, Sept. 3, 2004, p.1407–8

[3] Pro Rabirio Posthumo XIV.40

Job 37:18 Hast thou with Him spread out the sky, which is strong, and as a molten looking glass?

Is. 3:23 (v. 18: In that day the Lord will take away the bravery of their tinkling ornaments about their feet. . . , and) the glasses, and the fine linen, and the hoods, and the vails.

I Cor. 13:12 For now we see through a glass, darkly; but then face to face: now I know in part; but then shall I know even as also I am known.

II Cor. 3:18 But we all, with open face beholding as in a glass the glory of the Lord, are changed into the same image from glory to glory, even as by the Spirit of the Lord.

Rev. 4:6 And before the throne there was a sea of glass like unto crystal; and in the midst of the throne, and round about the throne, were four beasts full of eyes before and behind.

Rev. 15:2 And I saw as it were a sea of glass mingled with fire: and them that had gotten the victory over the beast, and over his image, and over his mark, and over the number of his name, stand on the sea of glass, having the harps of God.

Rev. 21:18 And the building of the wall of it was of jasper: and the city was pure gold, like unto clear glass.

Rev. 21:21 And the twelve gates were twelve pearls; every several gate was of one pearl: and the street of the city was pure gold, as it were transparent glass.

Rome

With the rise of the Roman Empire, glass making once again followed the money—this time from Egypt to Rome, where it was embraced to a degree unrivaled even in modern times. The invention of glassblowing in particular coincided with the peak of Roman civilization—glass vessels were produced cheaply and in large quantities. Fine pieces became highly prized and symbols of wealth. “Its success was so great that it began to undermine its main competitor, ceramics. Glass was principally used for containers of various kinds: dishes, bottles, jugs, cups, plates, spoons, even lamps and inkwells. It was also used for pavements, for coating walls, for forcing frames for seedlings, and even for drainpipes. It is no exaggeration to say that glass was used for a wider range of objects than at any other time in history, including the present. It was especially appreciated for the way it enhanced the attractiveness of the favourite Roman drink, wine."[1]

Of the five main uses for glass—jewelry (glass beads, etc.), vessels (like goblets and other domestic ware), windows, lenses, and mirrors—Rome developed jewelry and vessels most of all, although the other uses were known but not adopted to any great extent. (Although it might be a bit unfair to call it 'Roman Glass' when Rome was really relying on foreign expertise and glassmakers 'acquired' by the Empire.)

Window glass was apparently made by casting, and pieces of considerable size were made[2], but window glass was never particularly popular with the Romans—perhaps due to the temperate climate. The farther north, the more commonly are windows found. In Britain they were quite common after the Roman invasion and even into southern Scotland. It was in northern Europe that window technology developed and flourished after the fall of Rome.

The Romans knew how to make glass mirrors, yet they preferred metal ones. Archaeology has only uncovered a handful of Roman glass mirrors.

Similarly, the use of glass to magnify objects was probably known. A little glass ball filled with water may have been used for fine work, such as engraving, but the Romans did not develop lenses or prisms.[3]

Glass making was at least attempted in every province that fell under the Roman yoke. And glass making persisted in the flotsam of the former Empire. Much of the production occurred on the edges of the old Empire. The Roman love of glass had spread as far as Afghanistan and the central Sahara, and as far north as Scotland and Scandinavian. "When the barbarians overran the Roman Empire, they had already

[1] Glass, A World History, Macfarlane, p.14

[2] For a particularly stunning example of ancient glass casting, see the 8.5 ton slab of glass—the third largest ever made—cast in ancient times. Kurinsky, 214

[3] Glass, A World History, Macfarlane, p.16

absorbed glass as an essential part of their lives, and this tradition continued."[1]

So glass making persisted. Different regions developed their own styles of glassware, of course. And windows became a high art form in the painted and stained glass windows of the medieval era. There are references to such windows from fifth century France onward; by 1000 painted glass is mentioned quite frequently in church records. The Benedictine order in particular gave impetus to window glass—they saw glass as a way of glorifying God through their involvement in its actual production in their monasteries, and injected huge amounts of skill and money into its development. [2]

Venice

But like a phoenix arising from the ashes, another city in formerly Roman Italy arose to be the next center of glass making—Venice.

It seems likely that the tradition of glass-making never died out in Italy, especially in the northern Adriatic area around Venice.[3] Yet it was really from the thirteenth century that Italian, and particularly Venetian, glass-making began to influence the whole of Europe. Venice in particular was blessed by a bay that facilitated trade, and by lagoon sand and alkali plants necessary for glassmaking. By 1268 the fiolarii of Venice were apparently organized in a guild, and in 1271 the Capitolare was created: an agreement between the craftsmen, represented by their gastaldo who was elected from among their members, and the Republic's officials for the surveillance of the crafts, I Guistizieri Vechhi. The Capitolare laid down the rules for the workings of the glass-houses: No glass house was to have fewer than three working-holes in their furnaces. These were to be fired with willow or alder. The working year was limited to the seven months from January to August, the rest of the year employed in the making—up of accounts, repairs and so on.

The Capitolare also set out rules for the sales of products: No glass was

[1] Glass, A World History, Macfarlane, p.19
[2] Glass, A World History, Macfarlane, p.20
[3] Polak, 53

to be imported into Venice. The export of products was to be carried out during that part of the year when the furnaces were idle, between August and January.

The main edifice of the Capitolare of 1271 remained standing for more than five hundred years, in fact until the final formal dissolution of the guilds of the Venetian glassmakers in 1806 with the fall of Venice shortly after Napoleon conquered Italy.[1]

From early times glassblowers from Venice had set up their glass-houses at Murano, a lagoon island situated about five kilometers north of Venice; a rowboat could cover the distance in an hour. By a decree of 1292 the Grand Council of Venice encouraged the removal of all Venetian glass-houses to Murano, where the risks in the case of fire were smaller than in Venice itself. According to some historians, the glassmakers were encouraged to do so because, once established on the island, they were virtual prisoners, so strict were the regulations controlling the glass making industry against 'industrial secrets' becoming known abroad. On pain of death no craftsman could leave Moreno or even teach a resident foreigner any of the trade secrets without express permission—which was seldom given.[2] There are even stories of relentless assassins in pursuit of fleeing glassmakers-in one case, to the very gates of Prague, Czechoslovakia-over 500 km (300 miles) away.[3]

Of course truth and legend are difficult to separate here, but it is safe to say that very harsh measures were involved, since their 'industrial secrets' were of such enormous value. A register of 1454 specified the measures of the guild against fled glassworkers. First he was strongly urged to return, and would receive a full pardon and a job. If he refused, his relatives were thrown into prison. If he still refused, an assassin was assigned. Two cases of murder of this kind are mentioned in Venetian archives, and there were probably more.[4]

As if assassins weren't enough, the life of glassmakers wasn't an easy one to begin with. According to a book in 1713:

> Certainly no one could endure for long the strain of such

[1] Polak, 53-54, 66

[2] Elville, 61

[3] Zerwick, C., Short History of Glass, p. 50

[4] Hannes, 19

> work as these men have to do, nor could it be kept up except by robust men in the prime of life. During the process of making glass vessels the men stand continually half-naked in freezing winter weather near very hot furnaces and keep their eyes fixed on the fire and molten glass . . . their eyes have to meet the full force of the fire . . . they shrivel because their nature and substance . . . is burnt up and destroyed by the excessive heat.[1]

By about 1300 the removal of glassmakers from Venice to Murano was more or less complete, and to this day Murano has been the center for Venetian glassmaking.[2] By the end of the sixteenth century, when Venice had about 170,000 inhabitants, Murano had a population of some 7,000, about 3,000 of which are believed to be directly concerned with glassmaking.[3]

Furthermore, an edict in 1275 forbade the export of sand, alum and glass fragments.[4]

By the early fourteenth century Venetian glass production was in full swing, and Venice's vast fleet for war and commerce enabled her to trade as far as England and Flanders.[5] Venice at this time was also "Queen of the Sea," giving her ample facilities for exporting her manufacture to every part of the known world; and for a long period held the monopoly of supplying the cities of Europe with crystal glass.[6]

The destruction of the city of Damascus (a great glass center) by the Mongolian war-lord Timur the Great in 1400 probably led to an influx of craftsmen to Italy, as may also have happened in 1453 when Constantinople finally fell to the Turks.[7]

One of the main innovations of the Venetian glass-makers was a type of glass called *cristallo*, invented between 1450 and 1460.[Polak, 58] It could be blown very thin, was colorless and free from flaws, and

[1] Zerwock, History of Glass p. 58 ???
[2] Polak, 54
[3] Polak, 56
[4] Hannes, 19
[5] Polak, 64
[6] Reminisences, 24
[7] Glass, A World History, Macfarlane, p.20

enabled glass-makers to make wonderfully elegant and intricate forms. Its purity and thinness was an object of fascination and desire.[1]

Though Venetian control over the glassmakers and their families was strict, these craftsmen were highly regarded. Many were given patrician standing, their daughters being permitted to marry noblemen.[2] The government of Venice also conferred the title of "Gentleman" (no idle title in those days) on all who became accomplished in the manufacture.[3]

So important to Venice was the glass-making craft that when Henry III of France visited Venice in 1574, it is said that his ship was greeted by glassblowers borne on a huge raft with a furnace in the shape of a mammoth sea monster spewing flames.[4]

Not surprisingly, this strict secrecy surrounding Venetian glass making would have invested the art with an air of romance; and legends, probably invented for the purpose, created a maximum of wonder to the uninitiated.

In fact, Venetian glass was so expensive that the modern practice of one glass per guest was actually unheard of as late as the 16th century. There might be only one glass to a table, so "a man should wipe his mouth on napkin or table-cloth." If there was one glass to two guests, "one should empty every time one drinks so as to leave nothing for his companion", a situation presumably alleviated by the cup-bearer refilling the glass.[5]

At about this time, throughout Europe[???] even window glass was so expensive the glass panes were removed and put in a safe place when the occupants left the house for any time.[6]

But with the fall of the Republic of Venice in 1797, the glass art of Murano suffered a swift decline.

We close this section with an extract from a "Familiar Letter" of James

---

[1] Glass, A World History, Macfarlane, p.21
[2] Zerwick, C., Short History of Glass, p. 50
[3] Reminiscences, 24
[4] Zerwick, C., Short History of Glass, p. 50
[5] English Glass, Charleston, 52
[6] Technics & Civilization, Mumford, p. 124

Howell, historian to Charles II, written in 1621:

> Murano, a little island about one mile from Venice, is the place where crystal glass is made, and it is a rare right to see whole streets where on one side there are twenty furnaces at work. They say here, that although one should transfer a furnace from Murano to Venice, or to any of the little assembled islands about here, or to any other part of the earth beside, to use the same materials, the same workmen, the same fuel, and the selfsame ingredients every way, yet they cannot make crystal glass in that perfection for beauty and lustre as at Murano. Some impute it to the circumambient air, which is purified and attenuated by the concurrence of so many fires, that are in these furnaces night and day perpetually, for they are like the vestal fires, never going out.[1]

Northern Europe

Glassmaking was certainly introduced into Northern Europe by the Romans at the latest, but the glassmaking tradition there may date even earlier, to Celtic times.[2] These glass houses were located in forests. Forests were used for many purposes, including hunting for food and pleasure, for timber for houses and ships, and for fuel for domestic heating and commercial use—like glassmaking. Glassmakers were only rarely considered as primary claimants, more often they were delegated to hilly and remote country, where hunting was difficult and the timber not of prime quality.[3] Sometimes the glassmakers were 'used' to clear the land of forests to make way for agriculture. These glass houses must have been small, informal structures, worked as long as the fuel—supply immediately around the furnace lasted; when it was exhausted the furnace was left and another erected at a new location.[4]

But around the time of the Renaissance, as communication improved and demand increased, these itinerant furnaces gave way to permanent

[1]Howell, The Familiar Letters of James Howell, May 30, 1621
[2]Hannes, 23
[3]Polak, 38
[4]Polak, 39

glass houses.[1] Glassworks were frequently located in areas where other industries were already established—glassmakers and potters worked side by side in Lorraine, while ironworks were interspersed with glass-houses in northern Bohemia. The industries depended on the same fuels and waterpower, and they could use the same communications lines to their markets. Relations weren't always cordial, mostly because they were all competing for the same fuel. But at the same time they could exchange useful technical information, and the glassmakers needed both pottery and iron tools while the potters and ironfounders needed windows, bottles and drinking glasses.[2]

From the early part of the sixteenth century, and especially from about 1550 onwards, great numbers of Italian glassmakers traveled to the north and began working there, permanently or periodically, in spite of the protests of the Venetian authorites. Some Italian towns (such as Altare on the Ligurian coast) actually encouraged glassblowers to go abroad and work for certain periods of the year.[3]

In general, with the rise of the Renaissance and the improving economic conditions that accompanied it, glassmaking ' la faon de Venise' as it was called ("in the Viennese fashion") slowly disseminated throughout Europe, from France to Scandinavia.[4]

Alchemy

If changing common sand and burnt plants into a wondrous object of glass isn't an alchemical transformation-then what is! If you can do that, changing lead into gold doesn't seem so far fetched. Writing about glassmaking, Howell writes in June 1, 1621:

> When I pry'd into the materials, and observed the furnaces and calcinations, the transubstantiations, the liquefactions that are incident to this art, my thoughts were raised to a higher Speculation. . . [5]

[1]Polak, 40
[2]Polak, 41
[3]Polak, 70–71
[4]See Polak, 70ff for a good survey broken down by region
[5]Howell, 68

Alchemy in the ancient world was far more than 'changing lead into gold', it was really proto-chemistry and proto-pharmacology.[1]. Alchemy certainly had its charlatans, but it also worked out—through long hard, and sometimes dangerous trial and error—processes for making now commonly used chemicals—like 'aqua fortis' (nitric acid) and 'oil of vitriol' (sulfuric acid)[2]. This practical knowledge was indispensable in the Alchemical Transformation of ancient alchemy into modern chemistry.[3] And much of the modern chemist's apparatus comes straight out of the alchemist's laboratory.

Neri, The Art of Glass (1612) (the first book on glassmaking) says:

> "some will, and perhaps with some reason, say that the invention of Glass was found out by the Alchymists; for they desiring to imitate jewels, found out glass; a thing perhaps not far from truth."[Neri, 47]

In the ancient world, the centers of alchemy followed the centers of 'learning' in general. Alchemy appears in ancient Egypt-at the same time as Egyptian glass. When the center of glass-making moved to Alexandria-so did alchemy. And alchemy and glass migrated together to Rome.

Not surprisingly, the lines distinguishing Metallurgy from alchemy and glassmaking were rather unclear until the founding of modern chemistry.[See The Forge and the Crucible, Eliade, M., U of Chicago Press, 1978]. In fact, in the glass literature as late as the early 20th century, glass was still being referred to as another 'metal'. [4] After all, it was produced by similar means: take a certain type of 'earth' (sand, or ore) and heat it in a furnace which was as hot as the technology available then could make it, and a remarkably different substance emerges.

[1]For an excellent survey, see Moran

[2]Moran, 15

[3]And one of the goals of ancient alchemy has been achieved. In 1980, Glenn Seaborg (1912-1999) transmuted several thousand atoms of lead into gold at the Lawrence Berkeley Laboratory, though the amount of energy used and the microscopic quantities created negated any possible financial benefit. For his work on transuranium elements (elements heavier than uranium, the vast majority of which are artificially created) he was awarded the Nobel Prize in chemistry in 1951.

[4]See, for example, ???

And there is a tradition of an attempt to find an 'alloy' of glass that was 'malleable' (flexible) in the same way that other 'metals' like copper are.[1] With the fall of Rome, the craft of glass working survived in the West (no literacy required to work glass), but the more learned and literate alchemy did not. Along with mathematics, the works of Plato and Aristotle, and so much of Western learning, alchemy was preserved in the Middle East by the Arabs.

With the fall of Damascus, and Constantinople in 1453, all sorts of scholars and artisans fled to the West. They brought with them mathematics, and new glass-making techniques, and Aristotle, and alchemy. This influx of new knowledge is generally regarded as one of the major impetuses of the Renaissance. The first true alchemist in Medieval Europe was Roger Bacon (1214-1294), a Franciscan friar, considered one of the earliest advocates of the modern scientific method, but who also emphasized his reliance on the occult and the alchemical traditions. And he was intimately acquainted with the philosophical and scientific insights of the Arab world, one of the most advanced civilizations at that time.

Influx of Greek scholars into the West began much earlier, especially in the Northern Italian city-states that had started welcoming scholars in the eleventh and twelfth centuries. [???] The chancellor of Florence Coluccio Salutati Bethis cultural exchange in 1396 by inviting a Byzantine Scholar to lecture at the U. of Florence. It was the Italians' hunger for Latin Classics and a command of the Greek Language which fueled the Renaiisance.[2]

Glass is uniquely suited to alchemical (and chemical) research, because it is extremely chemically inert (doesn't react with the chemicals inside), and you can also see what's going on.

[??? glass-makers also alchemists: Neri [Neri, 52] Agricola]

So it's not too surprising that the line between men who were working out new ways of coloring and working glass, inventing new kinds of glass and ways of coloring glass in their laboratories with furnaces, strange apparatus and chemicals, vs. doing alchemy in their laboratories with furnaces, strange apparatus and chemicals -well, what's the

[1] Neri, 48
[2] wikipedia: fall of Constantinople ???

difference?[1]

Also, apparently a common belief of medieval and early renaissance glassblowers was that a Salamander lived in the furnace:

> It was believed, too, that at certain times this wonderful being issued from his abode, and as opportunity offered, carried back some victim to his fiery bed. The absence of workmen, who sometimes departed secretly for foreign lands, was always accounted for by the hypothesis that in some unguarded moment they had fallen prey to the Salamander. Visitors, too, whose courage could sustain them, were directed to look through the bye-hole to the interior of the furnace, and no one failed to discover the monster coiled in his glowing bed, and glaring with fiery eyes upon the intruder, much to his discomfiture, and effectually as to his retreat.[2]

(The Salamander occurs frequently in the alchemical literature-a creature that lives in fire.) Furthermore, it was the custom for the workmen, in setting the pots of glass in the furnace, to protect themselves from the heat by dressing in the skins of animals from head to foot; to this 'outer' garb were added glass goggles, thus creating the most hideous-looking monsters. "Show was then made of themselves in the neighborhood, to the infinite alarm of children, old women, and others." [Reminiscences, 48] These furnaces were operated day and night.

Not surprisingly, glass itself was regarded as having magical properties. Venetian glass in particular, when made under certain astronomical influences, would 'fly into pieces' if any poisonous liquid was placed in them; and sales of vessels of this kind were made at enormous prices.[Reminiscences, 49] In the 15th century, Philip Massinger would write of crystal glass:

> Than hold one drop that's venomous, of itself
> It flies in pieces and deludes the traitor.[3]

Howell in a letter of June 1, 1621 repeats the same notion:

[1] Type 'alchemy' and 'glass' into your favorite search engine and see how many modern glass artisans still associate their art with alchemy.

[2] Reminiscences, 47

[3] English Glass, Charleston, 50–51

> . . . a Crystal Glass . . . hath this property above Gold or Silver, or any other mineral, to admit no poison.[Howell, 67 In the same letter he goes on to quote a popular saying: "The first handsome woman that ever was made was made of Venice Glass."]

This would certainly be a highly valued feature in Italy in the 14th through 16th centuries under the Borgias (notorious for poisoning and intrigue), as well as the houses of the nobility in general throughout Europe. (It turns out there might actually be some basis in science for the claim: glass of the time may have had low stability to anything slightly corrosive-including poison. [1])

Fulcanelli goes so far as to assert, in his *Le Mystre des Cathdrales*[translated in Fulcanelli: Master Alchemist, Sworder, M., Brotherhood of Life, Las Vegas,1990] , that alchemical 'secrets' are displayed in plain view in the stain glass windows and statuary of various Gothic cathedrals.

We can easily see how the modern clear distinction between 'alchemist' and 'chemist' was not so clear at all in Elizabethan days from the following quote:

> It [making iron] breedeth in like manner great expense and waste of wood, as doth the making of our pots and table vessels of glass, wherein is much loss, sith [since] it is so quickly broken; and yet (as I think) easy to be made tougher, if our alchemists could once find the true birth or production of the red man, whose mixture would induce a metallic toughness unto it, whereby it should abide the hammer. [Froissart, 323]

England

The supremacy (and enormous profits) of Venetian glass was challenged by attempts to make glass of similar quality in England itself. Initial unsuccessful attempts were made as early as 1530, but the real beginnings of a crystal glass industry in England date from 1567. [2]

[1] See Neri, 14
[2] English Glass, Charleston, 53

In England, Holinshed, in his *Chronicles*, published during the reign of Elizabeth, says:

> It is a world to see in these our days, wherein gold and silver aboundeth, that our gentility, as loathing these metals, (because of the plenty,) do now genrally choose rather the Venice Glasses, both for our wine and beer, than any of these metals, or stone, wherein before time we have been accustomed to drink, but such is the nature of man generally, that it most coveth things difficult to be attained. . . . The poorest endeavor to have glasses also if they may; but as the Venetian is somewhat too dear for them, they content themselves with such as are made at home. . . [1]

John Greene of London in 1670's asked that Venetian glasses being imported be made thick and heavy to withstand the hazards of transport by sea (which would make them completely unmusical).[2]

Essentially, at about 1550 wine glasses were either extraordinarily expensive Venetian imports or locally made glasses—both too thick for music. But by about 1750, musically suitable wineglasses were sufficiently inexpensive and available that sets of musical glasses (with a couple dozen glasses in an instrument) had become common. This transformation of the wine glass in England came about from many factors. . .

The Rise of the British Empire

Elizabeth I (1533–1603) ascended the throne in 1558, and under her reign England was transformed from an impoverished country torn apart by religious strife to one of the most powerful and prosperous countries in the world. Under her reign England defeated the Spanish Armada in 1588—effectively establishing England as a world class sea power. This was good for English commercial shipping, which was good for English trade, and England prospered. A building boom ensued. This was good for English glass makers.

[1] Friossart, p.275

[2] Savage, Glass & Glassware, 54

Elizabeth I was succeeded by James I (1566–1625), who ascended the throne in 1603, and continued her economic policies. Under his reign, the King James Bible was commissioned and published in 1611. Under the reigns of Elizabeth I and James I, Shakespeare (1564–1616) wrote and produced his plays.

The glass making industry continued to prosper. Much of this increase of demand for glass was for windows. All of England, and London in particular, was experiencing a construction boom, and needed glass. And glass windows were increasing in popularity. For example, "Hardwick Hall, more glass than wall" was completed by 1597. Occasionally a glass-house would be set up on the estate of a magnate building a new house which required extensive windows.[1]. And in 1666 the Great Fire of London, which raged for 5 days, destroyed approximately "thirteen thousand dwelling-houses, eight-nine churches, and St. Paul's Cathedral" [2] The good news is that the fire put an end to the Great Plague which had been tormenting the city. Reconstruction required more new windows.

And glass was becoming popular in coaches as well.[3]

More importantly, England was beginning to see the rise of the middle class, which wanted its own glassware to emulate the nobility.

Fuel

In 1550 glass-making and iron-making—both major industries in England—relied on wood for fuel. The growing demands for fuel for the growing glassmaking and iron mongering industries, for timber for shipbuilding, and for domestic building and heating was taxing the English forests. Beginning in 1585, Parliament passed a steady of stream of legislation that gradually prohibited the use of wood-fired furnaces.[4] As glassmaking switched to coal, new coal-fired glass furnace designs received new patents, effectively rendering the previous patents obsolete.

[1] English Glass, Charleston, 72–73

[2] Churchill, II, 269.

[3] English Glass, Charleston, 107

[4] English Glass, Charleston, 73ff

(England was the first to use coal to fire glass furnaces.[1]) 1610 saw the first patent for a coal-fired furnace, only to replaced by a patent for a newer model a year later.[2] Before coal, glassmaking patents had been in force for decades; now they were being rendered obsolete in a few years. This helped transform glassmaking from a stagnant monopoly to full-fledged competition. Also, once glassmakers were over the difficult transition, they found that coal was better than wood for firing glass furnaces.

Patents

'Patents' during the reign of Elizabeth I (1533–1603) were really monopolies granted by the Crown. Initially these monopolies were intended to encourage the development of local industries by granting sole profits from local production as well as tariff—if not the outright prohibition—of imports. During the reigns of Elizabeth I through Charles I (1600–1649), these monopolies became a way of financially rewarding loyal subjects without depleting the royal treasury. Better still, these 'patents' required an annual 'rent' to be paid to the Crown, so not only was the loyal subject financially rewarded from the profits of their monopoly, but the Crown derived an income at the same time. Frequently the holder of a patent/monopoly might not even know anything about the technology of the industry over which he held a patent.

For example, in 1612 a satisfactory coal-fired glass furnace had been established. And by 1615 the technique for firing glass-furnaces with coal was sufficiently developed and in production to justify the granting of a monopoly. In 'The Proclamation touching glasses' of that year, the use of wood for glass-furnaces was prohibited altogether, the import of glass from abroad was forbidden, and a royal monopoly for glassmaking in England, at an annual rent of £1000, was granted to a group of nine 'adventurers'. One of them, Sir Robert Mansell (1573–1656) soon bought out the others.[3] Mansell was a vice-admiral in the Navy, and unacquainted with the glass industry.[4]

[1] Howard,21

[2] English Glass, Charleston, 73???

[3] Polak, 113–4

[4] Price, 81

But the mood in England was increasingly against monopolies, because when a new monopoly was granted, long-standing businesses in that industry either had to submit to the newcomer monopoly holder or cease to exist. The 'Statute of Monopolies' of 1624 largely eliminated them, conferring monopoly powers to first inventors only. Glassmaking was specifically exempted, but the writing was on the wall.[1] In any event, there were sufficient loopholes in the Act that the problem of monopolies was not really solved at all.[2]

The problem continued to worsen:

> The practice of monopolies and all the evils it brought in its train rose to its greatest height in the reign of Charles I. The King's almost frantic shifts for money and the illegalities and evasions he indulged in to fill his treasury rose to inordinate heights. Wine, soap, salt, and almost every article of domestic consumption fell into the hands of the monopolist and rose in price out of all proportion to the profit gained by the Crown.[3]

The Mansell monopoly lasted until 1640. In that year Charles I was forced to summon Parliament for the first time in eleven years, and among their first decrees was to condemn and abolish the glass monopoly of Mansell.[4]

In 1649, all remaining patent/monopolies issued by the Crown, including glassmaking patents, were rendered null and void when the King of England, Charles I (1600–1649), was beheaded in the English Civil war and replaced by Oliver Cromwell, the "Lord Protector".

Upon Cromwell's death in 1658 his son Richard briefly succeeded him, but soon abdicated. The monarchy was restored in 1660 when Charles II was crowned King. Charles II was all too mindful of the grief that the patent/monopolies had caused Charles I. Consequently, he rarely granted monopolies *per se*, leaving an essentially modern 'patent'—a temporary 'monopoly' granted to the original creator of a new technology—

[1] English Glass, Charleston, 77
[2] MacLeod, 15
[3] Howard, 21
[4] Polak, 114

to evolve over the end of the 17th century into the 18th.[1]

1694 the Bank of England was established.

The English Monarchs, From Elizabeth I through the American Revolution
Elizabeth I (1558–1603) b. 1533
James I (1603–1625)
Charles I (1625–49)
Commonwealth:
Oliver Cromwell (1649–58)
Richard Cromwell (1658–59)
Restoration:
Charles II (1660–85)
James II (1685–88)
William III, Mary II (1689–1702)
Anne (1702–14)
George I (1714–27)
George II (1727–60)
George III (1760–1820)

Innovation In General

With the weakening of monopolies and the general growth of the English economy, the pace of competition and profits increased, and so did the pace of innovation. For example, Sir Kenelm (1603–1665) experimented with making stronger wine bottles, recommending that they be stopped 'close with Cork tied in'. Sir Kenelm was a glass-maker and alchemist as well as a diplomat and naval commander—he defeated French and Venetian fleets in the harbor of Scanderoon (on the southeast coast of Turkey) in 1628, making him a national hero. (Sir Kenelm was also a founder of the Royal Society, which very much concerned itself with glass, as well as other scientific matters. Benjamin Franklin would later be elected to this Society.) Bottle technology continued to develop, and around 1681 the corkscrew was invented, allowing the cork to be driven home flush. This "English bottle" was

[1] MacLeod, 24ff

soon an enormous international success, since it allowed the storage and maturing of wine in the bottle. Furthermore, the wine bottle glass they had developed was not only strong, but almost opaque, which protected the wine from the destructive effects of light. Alongside the new English lead-glass (discussed below), “the dark glass bottle formed the spearhead of the English penetration of continental [European] markets, making England for the first time a net exporter of glass.”[1]

The Invention of Lead Glass

The invention of lead-glass (not to be confused with ’leaded glass’—windows made of smaller pieces of glass held together with lead, as in stained glass windows—revolutionized glass making in England and made her one of the glass-making capitols of the world.

In 1664 Charles II chartered the Worshipful Committee of Glass Sellers. At its formation the Company ’made and sold looking glasses or mirrors, but only sold (it did not make) drinking or table glass, bottles, stoneware pots and other stoneware goods which were made for them by Glass makers and Pot makers, principally English, though some were imported, mostly from Venice’. From its inception, the Glass Sellers’ Company was entrusted with the ’supervision of the Glass and Pot Makers’ trades’, and was ’empowered to search for and condemn all defective and deceitful ware’.[2]

Frustrated with the virtual monopoly on the glass industry enjoyed by the Venetians, the Company of Glass Sellers commissioned George Ravenscroft (1618–1681) to experiment with native raw materials. [???] They wished to see England independent of foreign sources both for raw materials and finished glass.

In 1674 Ravenscroft petitioned the King for a patent for the making of a ’sort of crystalline glass resembling rock crystal’, and this petition was in a minute by the Attorney General ’that the glass is of a finer sort and made of other ingredients than any other glasshouses in England have used, and that the invention may be of considerable public advantage as the glasses thereby made equalize, if not excel, those imported from

[1] English Glass, Charleston, 95–96
[2] Charleston, 103–104

Venice and France.' The patent was granted for a term of seven years, but already Ravenscroft had concluded an agreement with the Glass Sellers that they would 'take and buy the said Glasses of Ravenscroft. . .'[1]

Lead glass is generally credited to George Ravenscroft (1618–1681), even though Ravenscroft—like so many patent holders—was himself not particularly knowledgeable about glass making[2]—perhaps the knowledge came from one of the gaffers (head glassblowers) in his employ named Giacomo da Costa.[3]. And the making of various kinds of lead glass is described in *The Art of Glass* (1611) [4], a book that was well known in England. But even though Ravenscroft wasn't personally responsible for the various technical innovations that resulted in his lead glass, he certainly made it a commercial success.

Lead glass was originally known as 'flint glass' because it was made with calcined flints instead of sand.[5] These calcined flints were available in England, eliminating the need to import Venetian *cuogoli*.[6] Lead glass was a far more brilliant, sparkling glass than had ever been made before. Besides the highly refractive appearance of lead crystal (which gives it its rainbow sparkles), lead glass was also much softer than regular glass, making it easier to engrave.

Ravenscroft's lead glass incorporated three innovations: the first being the addition of lead. It had long been known that the addition of lead to glass gave it a high refraction; for this reason the Italians had used it when making imitations of precious stones. What was new in Ravenscroft's use of lead was that he added it in greater quantities than anyone before. The second innovation was making the glass in coal-fired 'wind furnaces' which produced a stronger and more stable heat than wood-fired furnaces could give. The third was the use of the covered pot for the molten glass, which concentrated the heat inside the pot and prevented the dust given off by the coals from contaminating the glass.[7]

[1] Charleston,111
[2] Charleston, 111
[3] Kurinsky, 388; Buckley, 25
[4] Neri & Merrit, 15ff
[5] Buckley,24
[6] Charleston, 114
[7] Polak, 117

Ravenscroft's original formulation for glass was subject to 'crizzling', a defect which produces an internal network of glistening lines and a gradual breakdown of the surface. "Crizzling is caused by instability in the glass, usually due at this period to the habit of boiling the fluxing alkali repeatedly in aneffort to purify it. This resulted in a reduction of the calcium content. Calcium is a glass stabiliser, and without a stabiliser the alkali is leached out of glass by atmospheric action, leaving the slica network exposed and weakened."[1] Ravenscroft eventually solved this problem, as we can see from a statement issued by the Glass Sellers in the London Gazette 3 June 1676:

> Wee under written doe certify and attest that the defect of the flint glasses (which were formerly observed to crissel and decay) hath been redressed severall months agoe and the glasses since made have all proved durable and lasting as any glasses whatsoever. Moreover that the usual tryalls wherewith the essay of glasses are made have bene often reiterated on these new flint glasses with entire success and easy to be done againe by any body, which proofs the former glass would not undergoe, besides ye distinction of sound discernible by any person whatsoever.[2]

Here we see that stable and strong glass was still an ongoing area of research (which will have consequences for the development of glass music), and we see that unlike its predecessors, Ravenscroft's glasses were musical by 'ye distinction of a sound discernible by any person whatsoever'.

Lead glass certainly attracted the attention of foreign glassmakers. Some foreigners were already working in English glasshouses, and tried to establish lead glass abroad. The lack of proper fuel (coal) for the furnaces, and of proper clay for the glasspots, must have proved an almost fatal handicap to the foreigner attempting to make English lead glass.[3]

In 1674 Ravenscroft obtained a patent for his invention: lead glass. It was enormously successful. Ravenscroft died within a few days after expiration of his seven-year patent.

---

[1]Charleston,114

[2]Charleston, 113

[3]Buckley, 31

The Glass Tax

In 1745 Parliament passed an Excise on Glass—a tax by weight levied on the materials out of which lead glass was made. (This tax was increased in 1777, and again in 1822.)[1] The result of this tax was that glassmakers made their glasses thinner and lighter. "During the first forty-five years of the [18th] century, when there was no tax, and when glasses were sold by weight, there was every inducement to make simple massive glasses. During the period after 1745 there was an equal inducement to reduce the weight of the glass and to raise its value by other means."[2] In other words, make them thinner.

So, due to the combination of all these forces—running out of forests and switching to coal, changes in the patent climate, the beginnings of rise of the British Empire and a middle class that wanted glasses for themselves, the invention of lead glass, the Glass Tax—all these combined to reduce the price of glasses[A dozen wine glasses could be bought in 1758 for 2 shillings—very approximately 2 ounces of silver.[3], and to influence their shape into one conducive for music making. "The change was, of course, from an almost Venetian glass to one that is typically British. From a tall heavy glass, weighing often enough a solid pound, to a short light glass weighing a few ounces." [4]

America

Glassmaking in America began at Jamestown, Virginia, in 1608. The English Board of Trade decided that glass making would be an ideal use for the limitless forests of the New World. As we have seen, England at this time was running out of forests, forced to switch to coal, and domestic glassmaking was struggling with the conversion.

So a glass factory was founded in Jamestown, operating in the nearby forest a little over a year after the first colonists arrived in England.

[1] Buckley, 22
[2] Buckley, 40
[3] Buckley, Old English Glass, 74
[4] Buckley, 37

This "tryal of glasse" sent back to England that year was the first 'manufactured' product of any kind, so it can be truly said that glass was America's first industry. (Glass had already been made in the Western Hemisphere by Spanish craftsmen in Mexico around 1535.)[1] It's likely this first venture came to a close in the fall of 1609, and certainly came to a halt during 'The Starving Time' in 1609 to 1610 when all but 60 of the 500 inhabitants at Jamestown died.[2] Another venture was attempted in 1621 (less than a year after the Pilgrims landed at Plymouth) but was abandoned in 1624. The record suggests that little, if any glass was made.[3]

A lack of technical knowledge on the part of the English financiers, the terrible hardships of the New World (including weather, famine, and the Indians), the quarrelsome natures of the glassblowers sent to Jamestown (good glassblowers had no reason to leave the 'Old World', where demand for their skills was high) and the sheer distance to the markets in England all combined to make these first attempts at glass production in the colonies a failure, in spite of the abundance of fuel and good sand. Throughout the seventeenth and early eighteenth centuries the colonists were forced to import glass for their windows and glassware.[4]

Official British policy forbade all manufacture in the colonies: the colonies were to produce raw materials for factories in England and provide a market for the finished goods. This included glassmaking. There were a few attempts at defying this policy. Caspar Wistar, a Philadelphia brass-button manufacturer who had immigrated from Germany, imported German glassblowers in 1739 and established a factory in southern New Jersey to make bottles and windows. This venture was successful enough to be left to his son, who however closed in 1781, probably because of the Revolution.[5]

Another was by Henry William Stiegel, also a German. Like Wistar he also imported workmen (no other way to get them), like Wistar he had problems keeping them (some of whom wanted to start their own

[1] Harrington, 3
[2] Harrington, 9
[3] Harrington, 10
[4] Spillman, 7
[5] Spillman, 8

factories). Both Wistar and Stiegel appealed uncessfully to the patriotism of their fellow citizens to buy American instead of imported glass. Stiegel so overextended himself financially with his three factories that he eventually went to debtor's prison in 1774. [1]

After the Revolution there were no more restrictions against manufacture, but British mercantile policies still made it difficult for American manufacturers to compete. Finally, after 1790, Britian signed trade agreements with the new country; when the Acts of embargo and the ware of 1812 cut off the supply of British-made goods, American glassmakers were for the first time free of ruinous competition. There were setbacks to be sure, but glass production increased during every decade throughout the nineteenth century.[2]

This brings our brief history of glass to approximately the time of Franklin. To be sure, both formulations of glass, and techniques for working it continued to be developed at a ever increasing rate. But we leave the continuing story of glass in modern times to others as we turn our attention to glass *music*. . .

[1]Spillman, 8
[2]Spillman, 12

Part IV

Glass Music Before Franklin

Porcelain Instruments

Porcelain, which can superficially resemble glass, is essentially a kiln-fired clay. Unlike glass, which is formed when it is molten hot (over 650C/1200F), porcelain/clay is formed at room temperature and then baked. The methods of working porcelain, as well as its chemical and physical properties, are quite different from glass.

Porcelain musical instruments have their own long history, and predate musical instruments made of glass.

I haven't been able to find any example of a porcelain instrument played with the 'wet finger around the rim'. (And although modern wine goblets made of glass which musically work are extremely common, the author has yet to find a single porcelain wine goblet that works musically. The author does have a small procelain wine-glass that pitifully 'tries' to sing—and being the 'trained professional' he finds it easy to make a glass sing if it's able.)

The following list only includes porcelain cups (and excludes, for example, wind instruments made of porcelain like the ocarina). All are played with mallets or sticks. Some are tuned with water:

The Japanese "Hi"

The 'Hi' is essentially a porcelain teacup. "Its use was suggested by the sound of drinking cups when accidentally struck."[1] No mention of more than one 'hi', and no mention of water tuning.

The Chinese "Fou"

The 'Fou' is essentially a clay urn, struck with a wooden or bamboo stick.[2] No mention of more than one 'fou', and no mention of water tuning.

[1] Piggott, 175
[2] Liang, 25 (text), 68-69 (illustration)

The Chinese "Shui Chan"

A 13th century Chinese encyclopedia compiled by Ma Tuan [1] states that this instrument consisted of nine clay cups.[2]

The Indian "Jâlatharángini"

The Indian Jâlatharángini appeared perhaps around 700 CE. It consisted of a set of porcelain cups tuned with water, and was played with sticks covered with felt or tipped with cork. [3]

The Arabian "Tusut"

Played with sticks. The Persian Ibn Ghaybi describes a set of 'musical bowls' made of earthenware, whose notes were determined by the amount of water in each bowl. An author of the 9th/15th century describes a set of kizan (cups) and khawabi (jars) and their water content.[4]

A Persian Porcelain Instrument

An interesting example of playing porcelain cups is found in *The Voyages and Travels of the Ambassadors from the Duke of Holstein to the great Duke of Muscovy and the King of Persioa* 1633–39, written originally by Adam Olearius, rendered into English by John Davies:

> We were invited to sit down, and to eat of the fruit and conserves which were brought in, during which we had the divertisement of musick and dancing. And as a further honour to us, the Patriarch was sent for, who came in immediately,

[1] quoted in Moule, 147-148

[2] 13th century Ma Tuan does not mention water tuning, but 20th century Moule says they were "probably containing different quantities of water", yet offers no evidence to support this assertion—they could just as easily simply be different sized cups.

[3] Day, p.105

[4] Gibb 9:11

> having about him a cassock of water'd chamlet of a violet colour, and attended by two priests clad in black, with caps on their heads. He was no ill company: but the second of the two bretheren, whose name was Elias—by, made the best sport of any of the company. For, to heighten the divertisement of the ambassadors, he would needs play on the tamera, which is an instrument used by the Persians instead of the lute: and then, he called for seven porcelane cups, full of water, and striking them with two little sticks, he accorded them with the lute.[1]

Early Glass Instruments

Gafurius

Franchinus Gafurius (1451–1522) was a personal friend of Leonardo da Vinci and a famous musician in Italy in his day. His *Theorica musice* (Milan, 1492)[2] contains a woodcut showing various 'Pythagorian experiments'. One of these 'experiments' involves water filled cups; it is uncertain whether these cups are made of glass.

The discovery that musically pleasing combinations of notes have simple numerical relationship is ascribed to Pythagoras (569–475 B.C.E.), and certainly at least belongs to the School he founded. For example, the relationship of 'Do' to the 'Do' above it (as in "Do Re Me Fa So La Ti Do") is 1 to 2 (and is called an 'octave'), meaning this can be achieved by doubling the frequency, or making the string half as long (all other variables remaining unchanged), and so on. This much has been verified by modern physics, and it may be argued that this observation marks the beginnings of Western Science as we know it: quantifying experience with numerical relationships.

Gefarius text accompanying the woodcut reads as follows:

> After truly obtaining these sounds Pythagoras himself investigated by a number of methods whether a system encom-

[1] ???[London Chronicle March 1764? See Pohl, M & H in L, I.59
[2] Gafurius

> passing all harmonies consisted in these ratios, and he attached to equal strings weights derived from the same numbers and ratios. Then by adapting the length of various pipes so as to conform to particular dimensions and experimenting with them variously he upheld his absolute trustworthiness in these matters. Often too he measured vessels of equal weight, filled them with water according to some ratio and struck them with a rod. Also, by striking bronze bells of differing weights with a bronze or iron rod he concluded that musical intervals of this kind are formed and answer each other harmoniously through the ratios themselves. Indeed the effect whereby the length and thickness of strings of bronze and gut bring notes of music together in harmony as a result of the lead taken by actual ratios is more assured when derived from this source. And by using these methods he discovered a rule which takes its name from its character, not because the rule itself by which we measure sounds and their magnitudes is in the wood or bronze, but because an investigation of this kind is so firmly based that it cannot cause any investigator to come to an erroneous conclusion.... The diagram below demonstrates the forms of these specific proportions and the intervals that are derived from them.

In the upper left panel of this woodcut we see the event which legend says gave Pythagoras his insight. According to the legend, Pythagoras looks on as various blacksmiths pound the anvil, observing that different notes are produced depending on the weights of the hammers. Unfortunately this wouldn't actually work—a hammer that is twice as heavy or twice the size of another won't produce a note an octave different—the physics is more complex in this situation. ("IUBAL" which occurs in this panel is Latin for "Jubal", who was considered the inventor of music.)

In the upper right panel we see bells and musical cups. With regards to the bells, there is no one characteristic to which numbers can be assigned which will give the Pythagorean musical intervals: a bell that weighs twice as much as another will not necessarily be an octave apart. A bell that has twice the volume as another will not necessarily be an octave apart. A bell whose rim is twice the diameter, or circumference, as another will not necessarily be an octave apart. (All other factors being equal).

The same is true of the cups in the same upper right panel. (I invite the reader to take essentially identical drinking glasses from their kitchen cupboard and see if any amount of water in them can result in a pitch difference of an octave. It can't be done.) The image would suggest that the cups are transparent, but how else could the artist show the differing levels of water? The text does not say they are of glass, simply that they are 'vessels' (Latin: *ciatos*).

The lower left hand image suggests that the Pythagorean Ratios apply to the tension of strings on a zither-like instrument. Vincenzo Galileo (the famous Galileo's father) demonstrated that this is false—to achieve the Pythagorean musical ratio of 1 to 2 (the octave) it is actually necessary for the string tension to be 1 to 4.

The lower right hand image is the only unequivocally correct one: all other factors being equal: two pipes—one twice as long as the other—will have musical notes an octave apart.

The Ambras Collection

The first mention of a specifically glass musical instrument occurs in a 1596 inventory of the Ambras Collection at the Kunsthistorisches Museum ('Art History Museum'), Vienna which describes 'Ain instrument von glaszwerch'. This probably refers to the "Glasglockenklavier" ('glass glocken-keyboard') dedicated to Ferdinand of Tyrol, made in the 2nd half of the 16th century and currently on display at the museum. It was a keyboard instrument, three and a third octaves in compass[F/G/A chromatically to g2/a2]. At this point it's not possible to say if the instrument worked with glass-bells or glass-bars.[1]

'Buy My Fine Singing Glasses'

This image appears in *The Cries Of London*, a book consisting of a set of images of street vendors. It was first published in 1687, and reprinted

[1]Private correspondence with the Kunsthistorisches Museum

frequently thereafter until well into the 20th century (when the images were reprinted as cigarette cards). Over time various images were added, and it isn't clear exactly when this particular image appeared in this collection, but obviously it couldn't be earlier than 1687.

Clearly the street peddler is demonstrating his wares with one hand, and holding his inventory in the other. Whatever he is selling, it has to be cheap and simple to be a 'street product'. If it were musically useful and sophisticated at all, it would be sold in a proper music store—in the *The Cries Of London*, there is no image of "buy my fine violins". (When considering this image, keep in mind that artists frequently get details wrong of the musical instrument they are depicting.)

Although the end of the singing glass against his lips suggests a mouthpiece, all of the glasses in his inventory have straight ends.

It has been suggested that these glasses are played like a trumpet. Then, why no 'mouthpiece' in any of his inventory? And why wasn't this image titled "Buy My Fine Glass Trumpet?"

It has also been suggested that you would place a reed in it and play it like an oboe. But again, no reeds are apparent in his inventory, and why wasn't this image titled "Buy My Fine Glass Oboe"?

Perhaps the title means exactly what it says: a 'singing glass' is a glass for singing: you sing into it.

The (Single) Musical Glass

Before delving into the history of the singing wine glass per se, let's understand the singing/musical wine glass a little better.

Essentially a singing wine glass (or armonica cup) is a glass bell. Like a conventional bell made of metal, it has a resonant frequency, and if energy is put into the bell somehow—by striking it, for example—it resonates at its resonant frequency.

When you rub the rim of a wine glass with a wet finger, you're doing the same physics as a violin player sliding the bow over the string—the 'sticky' bow pulls the string to one side of the violin until it slips, and the bow is able to catch it and pull it again. This process repeats itself over and over hundreds if not thousands of times a second. The exact same process occurs when you rub your wet finger around the rim of the wine glass: your finger 'sticks' to the rim and torques the glass until it finally slips, until your finger is able to catch it and torque it again. This process repeats itself over and over (again, hundreds/thousands of times a second), which puts energy into the (glass) bell, whose physics only allow it to vibrate at musical frequencies. And, voila! A musical sound!

The standard wine glass is ideal for this because the stem gives the player something to hold on to while their wet rubbing finger puts energy into the bowl: if the player holds the bowl itself, this prevents the sides from vibrating—and thus no musical sound.

Adding water lowers the pitch (which the reader can verify for themselves in their own kitchen) mostly because-in effect-it adds mass to the sides of the glass, effectively making the sides heavier and thus lowering the pitch of the glass.[1]

Putting water inside the wine glass lowers the pitch, and so does putting water outside of the glass! Take a wine glass and check its pitch (with the wet finger around the rim); then run some water in your kitchen sink, put the glass in the sink so the glass is submerged except that the top part of the bell is above water, and check its pitch again. (See the figure below). Partially submerging the glass lowers the pitch.

In fact, having water both inside and outside of the glass lowers the pitch most of all. The reader can verify that adding water 'outside' the glass also lowers the pitch by placing a wine glass in a sink partially filled with water.

To recap: two essential elements are required for a musical glass: the walls of the bowl must be thin enough to vibrate easily, and it must have a stem—so the player can hold the glass by the stem without dampening the vibration of the bowl. You need both—thin-walled bowl, and a stem—or the wine glass simply will not sing with the wet finger around the rim. Neither the Romans nor their Byzantine successors particularly cared about blowing thin glasses. But that was a hallmark

[1] The water also adds a compressive factor that additionally complicates matters. See Chan.

of the Venetian glass blowers of the 14th through 16th centuries—particularly due to their invention of *cristallo*. These glasses were available to the wealthy throughout Europe.

Francis Bacon

The first mention of rubbing a wine glass rim with a moist finger apparently occurs in Francis Bacon (*Sylva Sylvarum*, 1627).

> 9. Take a glass, and put water into it, and wet your finger; and draw it round about the lip of the glass, pressing it somewhat hard; and after you have drawn it some few times about, it will make a the water frisk and sprinkle up in fine dew. This instance doth excellently demonstrate the force of compression in a solid body: for whensoever a solid body, as wood, stone, metal, &c. is pressed, there is an inward tumult in the parts thereof seeking to deliver themselves from the compression: and this is the cause of all violent motion.... [1]

Curiously, Bacon doesn't mention the sound of it (although a few paragraphs later he talks about sound in general). I've tried getting the water to 'frisk' in glasses that don't sing, and it looks like singing and 'frisking' are mutually dependent. Which seems reasonable from a physics point of view—the glass is going to have to be resonating (singing) for the walls of the glass to be able to put enough energy into the water to make it 'frisk'. (Try it!) It is curious that he doesn't mention the sound—did he have a hearing problem?

Galileo

If there is some question about Bacon's discussion of the wet-finger-around-the-wine-glass-rim phenomenon because he doesn't mention the sound, Galileo's discussion of the same phenomenon leaves no doubt.

[1] Montagu, B. The Works of Francis Bacon; Carey & Hart, Philadelphia, 1852, Vol. II, p. 8

Galileo's father Vincenzo Galileo (ca. 1525–1591) was a preeminent musician and music theorist of his day. Since antiquity, the theory of music had consisted of a mathematical discussion of harmony (based on Pythagoras' observations), in other words what are the mathematical ratios of the lengths of strings producing consonances, and how does one divide the octave? It had always been thought that not only was the ratio of lengths of two strings sounding an octave 2:1, but that so also was the ratio of the tensions of strings of equal lengths tuned an octave apart. Vincenzo showed that this is not the case: the ratio of tensions is 4:1. He found that ratio by hanging weights from strings. Here was an experiment (conducted in 1588, when his son Galileo was living at home and giving private lessons in mathematics) that produced numbers and bore directly on the age-old theoretical discussions. The example was certainly not lost on his son. The better part of Galileo's career was spent observing the heavens through his telescope, founding modern astronomy and proving the Copernican heliocentric model of the solar system in the process.

Galileo's lenses must have been expertly ground from glass that was both thick and clear, and surely made in Murano. Galileo continued to improve on the telescope until he finally attained magnifications of up to thirty times; this was actually the maximum that could be achieved with his basically simple telescope. It was with lenses like these that he made his revolutionary discoveries in astronomy. [1]

We also know that Galileo himself was an accomplished amateur lute player and composer, trained by his celebrated musical father no doubt. Galileo even used his musical training to subdivide time in his physics experiments![2]

Galileo's wrote his last book, *Two New Sciences* (1638)[3], while under house arrest by the Vatican. At the time he was suffering from very poor health, including the loss of sight in one of his eyes. (Medical attention was finally begrudgingly permitted after Galileo was completely blind, which occurred shortly after completing his book). He was also grieving the loss of his beloved daughter Maria Celeste (who died at age 33), and under strict orders not to write anything about astronomy. So in-

[1] Polak, 87-88
[2] Drake (1975)
[3] Galileo

stead he wrote about the strength and resistance of materials, and the physics of moving objects—his 'two new sciences'—arguably founding modern physics in the process. It encompassed 30 years of highly original experimentation, discussing aspects of the fracture of solid bodies, cohesion, leverage, the speed of light, sound, pendulums, falling bodies, projectiles, uniform motion, accelerated motion, the strength of wires, rods and beams under different loadings and placements-and the musical wineglass.

Galileo was also forbidden to publish anything, "not even the Lord's Prayer"[1], but Galileo managed to publish his book anyway by heroic intrigues which kept both him and his publisher out of trouble with the Inquisition.[2]

Galileo knew this was his last book, and he wrote it under terribly difficult circumstances, yet he digresses for several pages to consider the wet finger around the wine glass phenomenon:

> If one bows the base string on a viola rather smartly and brings near it a goblet of fine, thin glass having the same tone [tuono] as that of the string, this goblet will vibrate and audibly resound [the first mention of 'sympathetic resonance'?]. That the undulations of the medium are widely dispersed about the sounding body is evinced by the fact that a glass of water may be made to emit a tone merely by the friction of the finger-tip upon the rim of the glass; for in this water is produced a series of regular waves. . . . [Galileo, 99-101]

Athanasius Kircher

Father Athanasius Kircher (1601–1680) was a Jesuit priest, German linguist, ancient historian, mathematician, vulcanologist, physicist, theologian, inventor and music theorist (to name only a few), active mainly in Rome. He has been called 'the last man to know everything'. His encyclopedic works invited his readers to explore the connections among virtually every imaginable form of knowledge. "His books offered choice passages of forgotten texts to his readers in large folio volumes, dense

[1] Sharratt, 184
[2] Sharratt, 185

with the fonts of many languages and laden with the promise of more knowledge yet to come. The fact that he was unable—or perhaps unwilling—to release all of his books and editions of the wisdom of the ages into print made him all the more interesting and enigmatic."[1]

Kircher is a complex man to assess. He correctly determined that the Coptic language was descended from the language of ancient Egypt; yet his "translations" of the hieroglyphs were pure figments of his imagination. He had the prestige and connections to build a global network of Jesuits and non-Catholic men of letters to compile the first table of magnetic declination (the amount that true north differs from magnetic north, which varies by region of the world—something very useful for navigation).[Findlen, 21] Yet, presenting himself as an expert in decrypting codes, he was completely unable to decipher a simple case of 'mirror writing' presented to him by his friends. In his lifetime he was equally venerated and vilified. According to his autobiography[2], Kircher was:

- Almost drowned in a pond as a child.
- Almost hung by Protestants, but because of his piety they gave him money, returned his possessions and let him go.
- On another occasion, to escape the Protestants, he struggled through deep snow, ill-clad and penniless, begging for food for three days.
- Almost died from a leg infection but was cured after praying to the Virgin Mary.
- At a horse race he was accidentally pushed into their path, but crouched motionless and emerged unscathed.
- While crossing a river in winter, the ice he was on broke away and he floated downstream. He then swam to shore through the icy water and walked 3 miles through the snow to safety [3].

He failed his first application to the Jesuit College in Mainz, and was admitted as a novice to the College at Paderborn in 1618. Due to misplaced humility he disguised the fact that his intelligence was far above

[1] Findlen, 3-4
[2] Kircher, 1684
[3] Godwin, 10

that of his fellows, but eventually he came to his senses.[1]

In 1624 he taught mathematics, Hebrew and Syrian at Heiligenstadt-at the tender age of 23. During this time he published his first book, Ars Magnesia (1631) -his researches on magnetism. That same year once again the invasion of Protestant troops forced him to flee-this time leaving behind all of his manuscripts.[2]

Obviously Protestant Germany was a bad place for a bright Jesuit priest to be in those days, so Kircher's superiors allowed him to go to France. He ended up in Avignon around 1631, where once again he nearly got himself killed—this time when he was caught in a water-wheel which he had investigated a little too closely. Meanwhile, his teaching and studies continued happily until 1633, when he was summoned to Vienna to succeed the astronomer Johannes Kepler (d. 1631) as Mathematician to the Habsburg Court. [3]

Since Germany was still dangerous for Jesuits, Kircher took a route through northern Italy. He embarked with some other brothers of his order, and on the first stage of their journey from Avignon to Marseilles they all became ill. So the captain landed them on an island to recuperate-and promptly sailed away with all their possessions. They managed to hail some fishermen who took them to Marseilles, whence they sailed for Genoa in a more respectable ship. After two violent storms—in one of them the captain avoided shipwreck by guiding his ship into a narrow cavern-they at last reached Genoa. After two weeks Kircher continued his journey, and yet another storm drove the ship far past its intended destination—to Civitavecchia, the main port of Rome. Obviously Kircher could not miss the chance of seeing the Eternal City, so he set out on foot for the forty-mile pilgrimage. On reaching Rome in 1635 he found that he was expected! Friends and patrons had succeeded in having his orders changed, and he was to stay at the Roman College, the hub of the whole Jesuit Order, with a special commission to study Egyptian Hieroglyphs.[4] Kircher arrived in Rome shortly after Galileo had been placed under house arrest—Kircher steered clear of

[1]Godwin, 10
[2]Godwin, 11
[3]Godwin, 11
[4]Godwin, 11

open participation in the Copernican controversy.[1]

In 1636 Friedrich, Landgraf of Hesse-Darmstadt, the ruler of Kircher's home state, converted to Catholicism, largely through Kircher's efforts. He was received into the Church with great solemnity in Rome, and soon made Cardinal. Wishing to travel in Italy, he selected Kircher as his traveling companion. The party traveled south to Sicily and touched at Malta-everywhere Kircher took the opportunity to explore natural science: mirages, zoology, volcanism, and much more. When they reached Naples, Vesuvius threatened to erupt (the same volcano that we saw claimed Pliny the Elder a millennium and a half earlier), and Kircher climbed to the top of the volcano and had himself lowered into the crater to observe it more closely.[2]

That was his last adventure. He was made professor of Mathematics at the Roman College, a post that he held for eight years, after which he was completely relieved of his teaching duties so he could devote himself to study. Now he began to publish his major works, apparently concentrating on a different subject every three or four years. His reputation brought him scholars, letters and specimens from all over the world, and he amassed a vast collection of artifacts, curiosities of natural history, and scientific apparatus. Before his death, in fact, a large hall was provided to house the 'Museo Kircheriano', which was one of the world's first museums.[3]

By 1678, suffering the ailments of old age, he mainly occupied himself with spiritual exercises. He died in 1680.[4]

One of Kircher's 40 or so books was the *Phonurgia Nova* (1673)[5], devoted to acoustics, and containing all the then-known mathematics and physics concerning sound. It also includes his invention of the megaphone, as well as two experiments involving the 'wet-finger-around-the-wine-glass'.

In the first experiment, Kircher writes: [6]

[1] Findlen, 21
[2] Godwin, 13
[3] Godwin, 13
[4] Godwin, 14
[5] Kircher
[6] Kircher, 1673, 188-9

> Take a glass drinking vessel of any size whatever, which you are to fill with pure clear water. If, after doing this, you wet your index finger and rub the outer lip of the vessel in a circular movement for some time, you will after some time perceive an extraordinary sort of sound resembling ringing metal; when the water is stirred by this it will be so forcefully rippled that it appears to be set in motion by some wind.

Thus far, Kircher is correct. He continues

> If you fill this vessel only half-full, you will still perceive a sound, but pitched twice as high as the previous one, so that this sound will re-echo the earlier one at the perfect interval of an octave, and as a result you will observe that the rippling of the water is also more agitated. . .

Here Kircher is wrong, as the reader can verify for themselves in their own kitchen with a wineglass. The range of a wineglass from empty to as-full-as-possible-yet-the-glass-can-still-sing is about a major third ('do' to 'mi' in 'do re mi')—far short of the 'octave' that Kircher claims.

His other experiment involved five wine glasses:

> Let five drinking vessels of glass be taken, all of the same size and capacity, which you are to arrange so that they touch each other in the way which is portrayed here in the diagram below. Furthermore let one vessel be filled with aqua vitae (an aqueous solution of alcohol), a second with wine of the better sort, another with distilled water, another with a coarse liquid, such as sea water or olive-oil, and the central one with normal fresh water. Having done this you are to moisten a finger-tip and rub it continually on the lip of the vessel until you perceive the ringing noise which we showed you how to produce in the first experiment. For this very high pitched sound will to your amazement stir all the remaining liquids into motion, and the more violently the more one liquid surpasses another in fineness (subtlety). As a consequence the ethanol, true to its fiery or choleric nature, will leap up in the vessel more than the others; but the wine, true to its sanguine or airy nature, will undergo only a moderate agitation in its vessel. Furthermore the distilled water, which

> exhibits a phlegmatic constitution, will give rise to a movement that is slower and more sluggish than the others, but the coarse water contained in its vessel will, on account of its earthy make-up, be scarcely capable of any motion. One should conclude that music stirs emotions in our minds in the same manner. . .

No woodcut accompanies the first experiment (nor is one really needed), but the woodcut of the other clearly shows glasses with stems-a requirement for a musical glass. No mention here of different levels in the five glasses to achieve different pitches. Furthermore, the author has tried Kircher's experiment:

For:	the author used:
'aqua vitae' (an aqueous solution of alcohol)	Vodka
'wine of the better sort'	a nice merlot from 1998
'distilled water'	distilled water
'a coarse liquid, such as sea water or olive-oil'	olive oil
'the central one with normal fresh water'	tap water

The author simply couldn't get the results Kircher described: [???]

Based on what we now understand about the physics of acoustic resonance, Kircher's experiment is much more likely to succeed if the glasses are tuned to each other (something that Kircher doesn't specify). So the author tuned the glasses to each other and repeated the experiment [???]

The author concluded his attempt at recreating Kircher's experiment by toasting him with the glass of merlot. (The glass of vodka was appropriately disposed of as well.) Thus Kircher's two 'experiments' with wineglasses are both problematic, particularly the second—did he actually perform them?

It doesn't appear to have occurred to any of these men—Bacon, Galileo, or Kircher—to have a set of glasses tuned with water in order to play melodies. Why not? These were extremely bright men! Yet this is an idea that seems to spontaneously occur to little children at the Christmas Dinner table! Perhaps the answer is simply that, as we have seen, wineglasses of this period were extraordinarily expensive; a set of a couple dozen glasses on which to play music would have cost a king's ransom, and was thus beyond imagining.

Musical Glasses

G.P. Harsdoerfer

Georg Philipp Harsdrffer (1607–1658), German poet, was born at Nuremberg. He studied law at Altdorf and Strassburg, and subsequently traveled through the Netherlands, England, France and Italy. His knowledge of languages gained for him the appellation “the learned.” His writings in German and Latin fill fifty volumes.

In 1677 he published [along with Schwenter] a work entitled Delici physico-mathematic (1677)-which consists of 3 volumes of mathematical and physics curiosities (as in ’parlor tricks’), observations on music and poetry, designs for curious machines, observations on biology, etc. He also describes how to make “a merry wine-music”[1]:

> *To Make a Merry Wine-Music*
>
> Take eight glasses of equal form; put in the one a spoonful of wine, in the other two, in the third three, and so on; then let eight persons, with fingers dipped in wine, at the same moment pass them over the brim of the glasses and there will be heard a merry wine-music that the very ears will tingle. You can also have fewer glasses speak in thirds, fifths and octaves, by controlling the size of the glasses and the amount of water being more or less.
>
> A half-empty and completely-empty glass make an octave; 2/3 empty makes a fifth; 1/3 empty makes a third.
>
> How to synchronize music with clocks by means of a barrel / cylinder fitted with pegs / pins, is common knowledge. As to how such a contraption may evoke the body’s physical condition, cf. Part 13.

[1] Harsdoerfer, 2:147

Like Kircher, Harsdoerfer's assertions about 'a half-empty glass and a completely-empty glass make an octave. . . ' are completely wrong. (Try it!) Yet there still isn't any suggestion of tuning the glasses so a melody could be played.

Harsdoerfer also describes an experiment reminiscent of Kircher's 5 glasses [??? 2:488].

C.W. Gluck

In 1745 the composer Christoph Willibald Gluck (1714–1787) came to London seeking fame and fortune. At this period in time London and its environs were twice the population of Paris, and three times the population of Vienna, meaning that it offered more market opportunities (as opposed to patronage) than anywhere else, and acted as a magnet for musicians throughout Europe.[1]

Gluck's opera *La caduta de' giganti* was only repeated five times after the first performance.[Einstein, Gluck, 23] [Some other opera with more performances ???] In March he composed another opera: *Artamene* (actually adapted from previous operas he had written) which wasn't performed at all; and in that same month he gave a concert with Handel—the reigning musical king in London, who had said that Gluck 'knows no more counterpoint than my cook'.

In April, Gluck played a concerto on 26 glasses at a benefit for himself. [PBF X,117] An advertisement appeared in the General Advertiser for 23 April 1746:

> At Mr. Hickford's Great Room in Brewer's-street, on Monday, April 14, Signor Gluck, Composer of the Operas, will exhibit a Concert of Musick. He will play a Concert upon Twenty-six Drinking Glasses, tuned with Spring water, accompanied with the whole Band, being a new Instrument of his own invention, upon which he performs whatever may be done on a Violin or Harpsichord; and therefore hopes to satisfy the Curious, as well as the Lovers of Musick. To begin at

[1] Ehrlich, 3

> Half an hour after Six. Tickets Half a guinea each.[1]

Horace Walpole mentions this concert in a letter[???]:

> The operas flourish more than in any latter years; the composer is Gluck, a German; he is to have a benefit, at which he its to play a set of drinking glasses, which he modulates with water. I think I have heard you speak of having seen some such thing.

Gluck left London [???] We know he performed on his 'Drinking Glasses' again in Copenhagen in 1749, but that's it. Gluck's fortunes improved considerably after his London venture-perhaps he didn't need to resort to his 'Drinking Glasses' any more.

From Harsdorfer we know that the 'wet-finger' concept was known in Germany, Gluck's native country, so perhaps Gluck got the idea for the musical glasses from Harsdorfer, or from his travels in Italy, and brought that idea to London.

R. Pockrich

Richard Pockrich (c.1690–1759) (also spelled Pockeridge, Pockridge, Pokeridge, and Puckeridge) was born at his family's estate about 1690. Although of English descent on his father's side, his family had long been settled in north Ireland—at Derrylusk, Co. Monaghan, where they had their estate and extensive property. His father had raised and commanded an independent company during the Williamite wars (for the Irish throne), fought through "the late happy revolution," and was dangerously wounded at the siege of Athlone in 1690.[2]

His son Richard inherited an estate from him, worth £1000 per year according to Newburgh[3], and £4000 per year according to Pilkington[4]. Either way, Pockrich—or 'Captain Pockrich' as he preferred to be called—seems to have entirely dissipated his inheritance on a long list of schemes:

[1] Suum Cuique, p.59–60
[2] O'Donahue, 13–14
[3] Newburgh ???
[4] Pilkington ???

- In 1715 he settled in Dublin and established a brewery and distillery at Islandbridge, but the venture failed. When, later in life, he competed for the Royal Dublin Society's premium for the best barrel of ale, and lost, his contemporaries said that he "consoled himself by philosophically and courageously drinking his own brew."[1]

- He sought to reclaim the bogs of Ireland by draining them and planting vineyards. Pockrich wrote pamplets in support of his theories, and tried to interest Parliament and the public in them without success.[2]

- He spent a large sum of money raising geese on several thousand acres of barren mountainous land, and declared that if properly encouraged he could supply the whole of the markets of Ireland, Great Britain and France.[3]

- He was something of an astrologer, and talked of building an observatory on one of the Wicklow hills for astrological purposes.[4]s

- He thought the drum had vast musical possibilities, and planned an orchestra of drums, twenty in number, varying in size and tone, which were to placed in a circle, and to be played by one person standing in the center and striking the drums as required.[5]

- He proposed to build unsinkable ships of metal for the maritime powers, and to supply each man-of-war with 500 tin boats which, he said, would float under any or all circumstances, and would prove invaluable in cases of shipwreck or collision. (Ships of his day were of course of entirely wooden construction. Metal hulled ships didn't appear until the 1870's.)

- He planned to provide everyone with a pair of wings for flying. He held that the day would come—and soon, if he obtained the necessary capital—when men and women would never dream of walking; when, as Newburgh says "it might be as common for men

[1] O'Donahue, 14
[2] O'Donahue, 14
[3] O'Donahue, 15
[4] O'Donahue, 15
[5] O'Donahue, 16

to call for their wings as now for their boots."[1]

- He ran for Parliament—twice—and failed. (1745 and 1749).[O'Donahue, 17]
- The project which excited Pockrich the most was his plans for blood transfusions. He declared that he could—by connecting a sick or old person with a healthy or young one (such as "strong healthy cook maid, or a kitchen wench"[Pilkington, 63]) by a pipe or tube—to revive the former by improving their blood to the degree that death would be virtually unknown.[2]
- He also had a plan for rejuvenating wrinkled skin:

> Take common brown paper, steep it in vinegar, then apply it to the forehead, the skin about the eyes, or any other winkled part; let it lie on some time, every half hour renewing the application. The wrinkles not only disappear, but the cheeks glow with a vermeil that excels the power of paint.[3]

Pockrich married Margaret White[widow of Francis White, Esq.] in 1745—each believing the other had money, and both were wrong. In 1748 his wife ran away with Theophilus Cibber, the theatrical celebrity, but the boat which carried them to Scotland was shipwrecked, and the elopers were lost with everyone else on board.[4]

Pockrich himself was to pass away a year later. He was on one of his musical tours through England, and happened to be lodging at Hamlin's Coffee House, Sweeting's Alley, near the Royal Exchange, London, when a disastrous fire broke out (some say it originated in Pockrich's room), destroying several houses and Pockrich as well.[5]

One of Pockrich's 'schemes' actually succeeded after all—the musical glasses. In fact, his musical glasses came to his aid when bailiffs arrived at his brewery to arrest him–perhaps for debtor's prison?:

[1] ???, quoted in O'Donahue, 17
[2] O'Donahue, 20
[3] O'Donahue, 22
[4] O'Donahue, 18
[5] O'Donahue, 23

> Mr. Pockrich, in his brewery near Island-bridge, happening one day to be seized by bailiffs, thus addressed them: 'Gentlemen, I am your prisoner but before I do myself the honour to attend you, give me leave as an humble performer of musick, to entertain you with a tune.' 'Sir,' replies one of the bailiffs, 'we come here to execute our warrant, not to hear tunes.' 'Gentlemen,' says the Captain, 'I submit to your authority, but in the interim, while you are only taking a dram, . . . Here Jack' calling to his servant, 'bring a bottle of the Ros Solis I lately distilled: I say Gentlemen, before you take a dram I shall dispatch my tune.' In the meantime he flourishes a prelude on the glasses, and afterwards displays his skill through all the pleasing turns and variations of the 'Black Joke'. The monsters, charmed with the magick of his sounds, for some time stand at gaze. At length, recovering [sic] their trance, thus accost the Captain: 'Sir, upon your parole of honour to keep the secret, we give you your liberty.' 'Tis well, playing upon the glasses is not more common: if it were, I believe our trade would find little employment.[1]

John Carteret Pilkington (??? Oxford Dictionary of National Biography) briefly collaborated with Pockrich and gives us a detailed description of the adventure in his autobiography. After a terrible sea voyage, and broke, he meets Pockrich while sitting in a pub [2]:

> I then called for some warm punch, and before I had drank two glasses, a tall middle-aged gentleman entered, with a big wig and a sword on. . . . . In the course of some general chat, I mentioned my singing at the concert in Cork; upon this he eagerly said, why, can you sing? I told him I believed I could: he begged I would just hum a tune to give him an idea of my voice and manner; when I did, he cry'd, bravo! Bravo! By G-d, I'll make your fortune. . .
>
> You must know, sir, that I am a gentleman who has run thro' a plentiful estate in schemes, for the publick good; . . . In the more gay and happy hours of my life, I studied musick as an amusement, and am, perhaps, the best master of har-

[1] Related by Brockhill Newburgh in his Essays Poetical, Moral and Critical, 1759
[2] Pilkington, 57ff

> mony in the known world; of this I will give you an immediate demonstration: saying so, he pulled from his sleeve sixteen large pins, and from his pocket a small hammer; with this he drove the pins into a deal table, all ranged one above the other, and some almost in as far as the heads: he then took from his side pocket two pieces of brass wire, and demanded what tune I would have: I told him the Black Joke: then lay your ear to the table, says he, hear and admire: I did so, and to my infinite amazement, he played it with all its variations, so as to sound somewhat like a dulcimer.
>
> Encouraged by the applauses I gave to this uncommon instrument, he took a parcel of drinking glasses, and tuned them, by putting different quantities of water in each: upon these he layed a number of the newest tunes in the most elegant taste, giving me delight and satisfaction. said he, I have at home glasses as large as bells of my own invention, that have a sound as loud as an organ, but more delicate and pleasing to the ear: now, Sir, as we are both gentlemen, and both possessed of excellence in the science of musick, if we unite together, we must make a fortune. . .

Pockrich called his instrument the *Angelic Organ*.[1] They proceed to Pockrich's house; on the strength of their 'future earnings' Pockrich 'borrows' from Pilkington the fare for the coach. Pockrich goes on to explain that his current lodgings are the only ones he could find where his extensive musical activities wouldn't disturb the neighbors; then Pockrich strikes a light . . .

> . . . which revealed to my eyes the most litter'd dirty hole I had ever yet seen: the furniture consisted of an old taudry bed, one rush bottom chair, a frame with a number of large glasses ranged on it, and the case of a violincello. I believe the Captain observed the dismay in my looks, and in order to comfort me, said, that he had made the people take all superfluous things out of the room, and that he never suffered a servant to clean it, lest their damn'd mops and brushes would break his glasses.

[1] Pilkington, 59

> He then set down and played Handel's water musick[1], and several other pieces, on the glasses, that indeed made some amends for the wretched appearance of every thing about him.[2]

With no other options, Pilkington decides to continue with Pockrich's plan. They rehearse and plan their program, and finally the big day arrives:

> The songs I was to sing at my first appearance were fixed upon, and every thing got in readiness for the important event; when I hoped my patience and long suffering would meet some reward, for by this time two months had sneaked away: at length the hour arrived. The Taylors hall was finely illuminated, the newspapers filled with encomiums on the angelick organ, every publick corner was covered with large bills, and tickets dispersed amongst the nobility. About three hours before the concert was to begin, the Captain went to arrange and tune his glasses, when unfortunately stepping out for some water, a large unmannerly sow entered, and, oh! Guess the rest!—threw down the whole machine, and covered the ground with glittering fragments; destroying not only the hopes of the publick, but ours of a present and future subsistence. When the Captain returned, and found his lofty castle in the air reduced to an heap of rubbish, he looked just like Mark Anthony, when he beholds the body of Julius Caesar on the earth, and says:
>
> Oh! Might Caesar, dost thou lie so low?
>
> He, however, supported the catastrophe with a dignity and heroism peculiar to great minds; and without staying for the company, desired the door-keepers would inform the world of the melancholy event, returning himself once more to his gloomy abode.[3]

After this Pilkington and Pockrich part company. They have a few chance encounters in the future, but no further collaborations.[???]

[1] premiered in 1717, so this narrative must take place after that date

[2] Pilkington, 60

[3] Pilkington, 66ff

At the time of this narrative Pockrich is still playing his glasses by striking them with sticks:

> Colonel Newburgh . . . was endeavoring to give Baron Dawson, a gentleman of true wit and humour, an idea of Pockridge's instrument, by telling he runs two sticks along the glasses, and by that means played distinct tunes; but, says the Colonel, except you were to see and hear it, you can have but little concept of its excellence; oh! But I have, said the Baron, 'tis like a blackguard boy, trailing a stick along iron rails.[1]

Pockrich did switch to the 'wet-finger-around-the-wine-glass' at some point[2], although it is unclear when that occurred.

We leave the good Captain with Newburgh's poetic elegy:

> Mourn him, ye bogs, in tears discharge your tides,
> No more shall Pockrich tap your spongy hides;
> Ye geese, ye ganders, cackle doleful lays,
> No more his mountain tops your flocks shall graze;
> Be silent, dumb, ye late harmonious glasses—
> Free from surprise, serenely sleep, ye lasses.
> Let drums, unbraced, in hollow murmurs tell
> How he that waked their thunders silent fell.
> Let tempests swell the surge, no more his boat,
> Secure from wreck, shall on the billows float;
> No more, ye sons of Nappy, shall his beer
> Or nut-brown ale your dropping spirits cheer,
> To his own castles, built sublime in air,
> Quitting his geese and bogs and glassy care,
> With blood infused, and, like a meteor bright,
> On his own pinions, Pock has winged his flight.[3]

[1] Pilkington, 65
[2] according to Benjamin Franklin. See his letter to Beccaria[???]
[3] ??? Essays, quoted from O'Donoghue, 24

Ann Ford

[??? Rosenthal, Michael, Thomas Gainsborough's Ann Ford, Art Bulletin, 12/1/1998] Ann Ford (1732–1824) was a performer on the musical glasses, well known in London, and the first to publish a 'method' on how to play them.

She was the only child of Thomas Ford, solicitor [lawyer] and Clerk of the Arraigns, and his wife (née Champion), the niece of Dr. Ford, the Queen's physician, and of Gilbert Ford, Attorney General of Jamaica.

How Ann received her musical training is unknown, but by her late teens she was apparently an accomplished musician who sang and played the English guitar and viola da gamba. She gave Sunday amateur concerts at which she was joined by eminent professionals like Dr. Arne, composer of Rule Britannia and Signor Tenducci the popular singer. These concerts were attended by the best society. On October 2, 1758, an attendee described a performance of Julius Caesar in which Ann Ford participated:

> They introduced a procession of vestals to mourn over Caesar's body [O]ne of them sang a dirge divinely well. She is, I think, take her for [what] she is . . . the most pleasing singer I ever heard I don't dare say the best because I have not judgment enough to decide, but I know that I would rather hear her than any Italian I have yet heard. She is a Miss Ford, daughter of a sort of Lawyer in the city.[1]

Ann was not content with these private parties-she longed to perform in public. Her father, however, "held sound, if old-fashioned, views about woman's place. It was, he maintained, in the home, and the less she gadded about the better"[2] He forbade any public performances, even as an amateur. When she was 23 her father actually obtained a magistrate's warrant to confine her to his house to prevent her from performing.[Leppert, 40] Arrested a second time for the same 'offense', she escaped from her 'paternal prison' to the house of her closest and dearest friend, Lady Elizabeth Thicknesse, who gave her sanctuary.

[1] ??? Letter 2 October 1758 from Mr. Frances Greville to Dr. Burney from Wilbury, quoted in Highfall, 5:365

[2] Gosse, 129

Mrs. Thicknesse enabled her to make arrangements for a series of five subscription concerts, which took place beginning March 18, 1760 at the Haymarket Theater, running through April. [1].

The advertisement for her first concert specified that she would "play a solo on the Viol da Gamba" (an instrument somewhat like the cello-held between the player's knees). This was somewhat scandalous as the viol da gamba was an instrument conventionally reserved to male performers. She also sang and played the guitar. The violinist Thomas Pinto, and other instrumentalists also contributed pieces.[2] No musical glasses yet.

Her father attempted to thwart the concerts by blocking the streets around the concert hall with Bow Street Runners—'bouncers' employed by the major London theaters on a regular basis to apprehend pick-pockets and generally keep the peace.[3] But Lord Tankerville dispersed them by threatening to turn out a detachment of the Guards. Naturally after this kind of publicity there was a rush to buy tickets, and in no time a sum of £1500 had been subscribed. The outlandishness of this venture can be seen by observing that hers were the only subscription concerts held in London between 1756 and 1763, which were "quite outside the mainstream," with "fashionable and sizeable" audiences "perhaps more attracted by the scandal than her music."[4] Her father also offered her a settled income if she would cease from public performance—she declined.[5] Gainsborough's "Ann Ford/Thickness"

Before she was 20 she had been painted by Nathaniel Hone (1718–1784) in the character of a muse.[6] And in 1760 Thomas Gainsborough (1727–1788) painted his famous portrait of her. The Thicknesses were friends and benefactors of Gainsborough—Phillip Thicknesse (1719–1792) would go on to write the first biography of Gainsborough[7] And Gainsborough and Miss Ford were both in fashionable Bath in 1758,

[1]Lydia M. Middleton, The Dictionary of National Biography [???]] [advertised in the Public Advertiser 7908 (Mar. 5, 1760), 7908 (Mar. 11, 1760), 7923 (Apr. 8, 1760)

[2]Gosse, 130

[3]Heard, 144

[4]McVeigh, 14

[5]Rosenthal, 3

[6]Gosse, 129

[7]Thicknesse, Phillip, A Sketch of the Life and Paintings of Thomas Gainsborough, Esq.; London, 1788

Figure 1: Gainsborough's *Ann Ford*

when he painted a portrait of Lord Villiers, son of the third earl of Jersey. (We shall meet his father, the aged and ailing Earl of Jersey presently.) This circle included William Whitehead, from whom we get a glimpse of the effect Miss Ford had:

> I have seen Miss Ford, nay almost lived with her ever since I have been here. She has a glorious voice, & infinitely more affectation than any Lady you know. You would be desperately in love with her in half an hour, & languish & die over her singing as much as she does in performance.[1]

Gainsborough had moved to Bath in Oct. 1759 to improve his fortunes, and rapidly built a reputation for painting superb likenesses. One well-worn tactic for promoting yourself was to display prominently in your painting room a striking, full-length portrait of a person who was then in the public eye. So, in 1760, a visitor to his studio would have been confronted with Ann Ford's full-sized portrait: 197 x 135 cm (77 1/2 x 52 7/8 in.), by far his most ambitious full-length work to date, a portrait of "stunning virtuosity and coloristic bravura."[2]

The picture certainly attracted attention. On October 23, 1760, Mrs. Mary Delany visited Gainsborough's studio and was struck by "Miss Ford's picture, a whole length with her guitar, a most extraordinary figure, handsome and bold; but I should be very sorry to have any one I loved set forth in such a manner." The portrait was, after all, by the standards of the day, borderline risqu. Joseph Burke has noted how Miss Ford ". . . crosses her legs above the knee, a masculine freedom unrecorded in the female portraits of Rubens and Van Dyck.. . . An air of high breeding redeems the suggestion of wantonness in the bold asymmetrical pose," a judgment borne out by a contemporary conduct book, which advised women against crossing their legs in company, "for such a free posture unveils more of a masculine disposition than sits decent upon a modest female."[3]

It was in the "Gainsborough circle" that Miss Ford met the Earl of Jersey, who was as captivated by her as everyone else. It appears Miss Ford had some sort of an affair with him, which included his offer of

[1]William Whitehead, ms. "Letters I,", quoted in Rosenthal, 2
[2]Rosenthal, 1
[3]Burke, J, English Art 1714-1800 (Oxford, Oxford U Press, 1976), 213-14

the enormous sum of eight hundred pounds per annum to come into his keeping. She declined. The affair ended in a violent quarrel, ultimately carried out in print. She published a thinly disguised pamphlet entitled A Letter from Miss Fxxd, addressed to a Person of Distinction, of which the following is a sample:

> When your L..d..p, on your knees, and with tears trickling down your aged cheeks, swore the sincerity of your love; when you told me you could not help your age, if I object to that, but every proof which was in your power I might command: You know, I then told your L..d..p, that your age and person were both very agreeable to me. I should have preferred you to any other man in the Kingdom, had you been single[1]

Her pamphlet sold 500 copies in the first five days. A year later it was reprinted, and at the same time appeared a reply from the Earl: A letter to Miss F..d, which quickly ran into a second edition.[2] And the January and February 1761 editions of the Gentleman's magazine treated readers to long excerpts from Ford's and Jersey's pamphlets. The Earl of Jersey also attempted to sabotage a concert by arranging an alternative entertainment to which he induced many of her invited guests to go instead.[McVeigh, 168] Unfortunately, in the court of public opinion, Ann came off the worse.[3]

Sometime before October Ann built a set of musical glasses and learned to play them—perhaps from Pockrich.[4] From October 24 to 30, 1761 Ann gave another a series of concerts, advertised to include "English airs, accompanying herself on the musical glasses"[5]. These concerts were far less ambitious: she "engaged the large room, late Cox's auction room" instead of the Haymarket Theater, and tickets cost one fourth of what she had charged in the spring of 1760.[6]

On November 2, 1761 she published the first 'method book' for playing

[1] quoted in Gosse, 132

[2] Gosse, 130

[3] For a lengthy discussion of Ann's plight, see Rosenthal, 4ff

[4] ??? She is stated by Gratton Flood, op.cit. p.289 (Encyclopedia Britannica, 11th ed. s.v. Harmonica?) to have been a pupil of Pockrich.

[5] advertised in the Public Advertiser 8407 (Oct. 14, 1761)

[6] Rosenthal, 9

the musical glasses: Instructions for Playing on the Musical Glasses, about which we will have more to say presently.

She also performed occasionally at Thomas Sheridan's lectures on Elocution. (In 1762 Sheridan published his Lectures on Elocution.) This came to an end in December, when the St. James's Chronicle[for 3 December 1761] announced that Ann Ford was to be replaced by Miss Lloyd:

> At Mr. Sheridan's lecture on Elocution, Miss Lloyd succeeds Miss Ford in performing on the musical glasses for the amusement of genteel company.[1]

Elizabeth Thicknesse was expecting her sixth child, so Ann came down from London to be with Elizabeth in her confinement and to accompany the Thicknesses to his purchased post as lieutenant-governor of Landguard Fort, Suffolk. In January 1762 the baby was born, but three months later Lady Elizabeth died, leaving behind three sons and three daughters.

On this Mr. Thicknesse was greatly affected, left the spot where she died; and after paying a last tribute to the virtues, and erecting a monument to the memory, of his departed wife, he consigned the care of his family to Miss Ford, who acted during his absence with such discretion and propriety, as to ensure entire approbation on his return. Time and a change of scene at length abated his grief; and he began to think that no one could better supply the loss of his lady than her most intimate friend.[2]

And so it was that on September 27, 1762 Ann Ford became Thicknesse's third wife. Ann was now 25, he was 43. Ann's father refused to attend the wedding.[3]

That was the end of Ann's short but extraordinary musical career.

Thicknesse was hardly a prize catch. He was notorious as an ardent supporter of the slave trade, a blackmailer, a lecher and a sadist. Famous for his ill temper, he fell out with many local people. He frequently published attacks on the people he disliked, which even led to

[1]Quoted in Toynbee, letter 351, fn.2
[2]Gosse, 127
[3]Gosse, 128

his imprisonment for libel. [???]

Gillray sums up Thicknesse's character in a caricature of him entitled "Lieutenant Governor Gall-Stone", depicting him with an explosive jet of steam coming out of his head. One of Thicknesse's nicknames was 'Dr Viper', reflected in this print by the medusa-like creature sits at his shoulder. This is Alecto, one of the Furies of Greek mythology, who has emerged from the jaws of hell to offer him assistance. This caricature is a parody it is a parody of the conventions of formal oil paintings, in which gentlemen are portrayed in their studies, depicted as learned and serious, surrounded by books.

But look! In the upper right-hand corner! Who do we see?

Gillray shows Thicknesse, his hands raised in admiration, standing behind Ann! She is shown playing her musical glasses to an audience of pigs, one of which is moved to tears. She is accompanied by an orchestra of little devils.

This caricature was published in 1790—perhaps Ann continued to perform on her glasses.

She certainly continued the literary career she began with her Instructions for Playing on the Musical Glasses by publishing *Sketches of the Lives and Writings of Ladies of France* in three volumes (1778-1781) and a novel, *The School for Fashion* (1800). She apparently raised Philip's six children (never had any of her own), and accompanied her husband in eight changes of residence in England, Spain and France (including during the French Revolution!). In the fall of 1792 Philip Thicknesse died in Ann's arms in a coach on the way from Paris to Boulogne.[Gosse, 313] On his monument Ann had inscribed:

> Phillip Thicknesse ... He married thrice ... thirdly [to] Ann Ford, his now affectionate and afflicted widow, who inscribes this stone to her ever honoured and beloved husband, as the last mark she can give of her gratitude and unbounded love to the memory of a man with whom she lived thirty years in perfect felicity.[1]

Ann was subsequently arrested and confined to a convent (as were all unaccompanied English women in France at that time) and upon the

[1] Gosse, 314

Figure 2: Gillray's *Lieutenant Governor Gall-stone*

Figure 3: Detail of Gillray's *Lieutenant Governor Gall-stone* showing Ann Ford

death of Robespierre in 1794 she was released. [Gosse, 313–4] She eventually returned to England, lived her last 18 years with her friend Sarah Cooper, and died at age 86 in January 1824.[1]

Ann's Instructions for Playing on the Musical Glasses begins:

> As the Tones of the Musical Glasses are, from their Similitude, more like the human Voice, than any musical Instrument, that ever was, or perhaps ever will be invented: there is much Reason to suppose, these Glasses will, in a short Time, become as common a piece of Furniture as an Harpsichord: and that every Lady, who can play or sing (but more particularly the latter) will be furnished with an Instrument, in itself of no great Expence: an Instrument, that not only sets off the Voice with greater Advantage than any other : and if I was to say, will assist and improve the Voice, I do not think I should say more than is due to the exquisite Tone it produces : a Tone superior to every other Instrument, and perhaps, the only one from which you hear the Effect without Cause.

She goes on to describe how to build and play an instrument. From the one illustration in her method, it appears that her instrument did not have all the sharps and flats.

She concludes:

> I have consulted an ingenious Organ-Builder who is very confident he can give the same Touch to these Glasses, and cause it to be done by the Keys, as on an Harpsichord: and I have employed him to make me an Organ with Glass Notes, instead of Pipes, which I have some Reason to believe I shall soon produce before the Public: and which, if it answers what the Workman seems confident it will, may be an Instrument that will astonish and delight more than any ever yet performed on. . . .

Miss Ford's "Organ with Glass Notes" never appeared.

Thomas Jefferson had a copy of Ann Ford's Instructions for the Musical

[1] Highfill 5:366

Glasses in his library. [1]

E. Delaval

Edward [??? Edmund?] Delaval (1729–1814) was a classical scholar and linguist, and made a European reputation for himself as well as a scientist, chiefly in chemistry and experimental philosophy. He matters a great deal for our story of the glass armonica, because Delaval also performed on the musical glasses, having—as he claimed—the largest set in England at the time.[source???]; and it was Delaval whom Benjamin Franklin heard and was inspired to invent the glass armonica.

Delaval was a Fellow of Pembroke Hall. Franklin helped his election as a Fellow of the Royal Society in 1759.[2] In 1769 Delaval was also on the committee—along with Franklin—appointed by the Royal Society to make recommendations on how to protect St. Paul's Cathedral from lightning strikes.[3] His other scientific contributions included: studying the effects of lightning; advocating the use of blunt lightning rods (instead of pointed, contradicting what Franklin advocated); he studied the specific gravities of several metals and their colors when bonded with glass; and the manufacture of artificial gems.[4] He was a candidate in 1762, and again in 1768, for the Professorship of Modern History at Cambridge—both times unsuccessfully. He was also known as 'Delaval the Loud' for his loud voice.[5], or sometimes just called 'Delly' by his friends[6], who considered him 'an honest gentleman'.[7]

About March 28th, 1760, Thomas Gray described one of Delaval's concerts to his friend James Brown, the Master of Pembroke:

> We heard Delaval the other night play upon the water glasses, & I was astonished. No instrument that I know has so celestial a tone. I thought it was a cherubim in a box.[8]

[1] Helen Cripe. Thomas Jefferson and Music. Appendix I, pp. 97-104.
[2] PBF VIII, 359–60
[3] PBF 16:145ff
[4] Debus, 437
[5] Toynbee, letters 461, 494
[6] e.g. Toynbee, letters 394, 395, 399, 414, 430
[7] Toynbee, letter 482
[8] Toynbee, letter 309

On Dec. 8, Gray wrote to Mason:

> Of all loves come to Cambridge out of hand, for here is Mr. Dillaval [sic] & a charming set of glasses that sing like nightingales, & we have concerts every other night, & shall stay here this month or two. . . [1]

But before long Gray took a dislike to Delaval and wrote in Jan. 1762

> I am still here: so are the glasses & their master: the first still delight me: I wish I could say as much for the second.[2]

??? The Musical Glasses After Franklin

We shall shortly turn our attention to Franklin's improvement on the musical glasses, called the glass armonica. But the musical glasses continued to have a life of their own in spite of and independent from Franklin's invention.

Other musical glasses players around Franklin's time include: Parry [harp? pg.58], Largeau, Wilkinson, Lloyd, Schuman.[3] The following is hardly a complete history of the musical glasses/glass harp, but is suggestive of some noteworthy people:

??? James Smith and his Musical Glasses

[1]Toynbee, letter 351
[2]Toynbee, letter 352
[3]Pohl, M&H in London, 60

James Smith's Tutor for the Musical Glasses (1829) [1] describes the disadvantages of Franklin's glass armonica:

> The Glasses of the Harmonica are very liable to break. The larger revolve with much greater velocity than the smaller; the foot is apt to tire in turning the machinery; when to this we add the high expense of the instrument, we need not be surprised that it never came into general use.[2]

Smith concludes by describing "the old slow, expressive soul-subduing melodies of Scotland, Ireland, and Wales, performed upon them [the musical glasses] by a player of taste and feeling":

> They come o'er the ear, like the sweet South,
> That breathes upon a bank of violets,
> Stealing, and giving odours.

??? Captain Menzies and his Glass Harp

[1] Smith

[2] Smith, iv

One of Franklin's armonica ideas was applied back to the musical glasses: tuning the glasses to have the correct pitch without water tuning. This is now called the 'glass harp'-musical glasses without the water tuning. Not only does this save the player a lot of trouble, but water in the glasses dampens the sound (the more water, the more muffled), so glass harps also sound better.

Smith describes an improvement to the Glasses devised by Captain Menzies of the Perthshire Militia, "a gentleman who, from his infancy, seems to have prosecuted the study of Musical Instruments with the most enthusiastic devotion". In Menzie's improvement the wineglasses were still upright-like the musical glasses tuned with water, but they were ground to pitch-like the glasses on Franklin's armonica, so they didn't need water tuning. [1] Later we shall meet Bruno Hoffman, a twentieth century glass performer who also tuned his musical glasses by grinding and called his instrument the 'glass harp'.

??? Hopkinson

[1] Smith, v.

In the 1820's, Francis Hopkinson Smith (1797–1872) gave concerts in America on a set of musical glasses which he called the Grand Harmonicon, of his own design and construction. He patented and manufactured his Grand Harmonicon, and published method books for it. He was also the grandson of the well-known American composer of the Revolutionary War period, Francis Hopkinson, whom we shall meet later in his attempts to add a keyboard to Franklin's invention. We'll meet Hopkinson later[1].

Smith was born in Virginia, and after marrying in 1820, the couple lived most of their married life in Baltimore, Maryland. They had seven children–three daughters and four sons.

During the 1820's Smith gave concerts and exhibitions of the Grand Harmonicon in the Virginia and Baltimore area. He claimed it was his own invention, that "only needs to be more generally known to become a fashionable appendage to the parlor."[2]

Smith not only played the musical glasses, he manufactured them, and was granted a patent in 1825. Alas we can know nothing more about the patent because of the fire in the U.S Archives in 1836 that destroyed all existing patent records.

In 1824 the Grand Harmonicon could be purchased from Smith at Fitzwhylsonn's store in Richmond, Virginia for fifty dollars. William Fitzwhylsonn was successively a school teacher, book and music store proprietor, and the mayor of Richmond.

Business was good. By 1826 all orders for replacement glasses were to be sent to him "post paid" at Eastville, Virginia, [3] and in 1829 all purchase orders were to be addressed to Baltimore, where Smith built his factory [4] and had a warehouse along with his home.

Alas, interest in the Grand Harmonicon began to fade, and by 1833 he had become a bank teller and had moved. [5] Two years later in 1835 Smith was hired as an "agent for the Franklin Fire Insurance Co. of

[1] See 112

[2] Stoutamire (1972), p. 157

[3] Smith, F.H., *Instructions for the Grand Harmonicon* (1826), Baltimore, p.4

[4] Smith, F.H., *Instructions for the Grand Harmonicon* (1829), Baltimore, p.3

[5] *Matchett's Baltimore City Directory* (1833) Baltimore, v.20, quoted in Ervine (1975), p.12

C# 12	C# 24	A# 21	G# 19	A# 9
D 25	C 23	B 22	A 20	D# 14
D 13	E 15	F 16	G 18	F# 17
C 11	B 10	A 8	G 6	G# 7
C 1	D 2	E 3	F 4	F# 5

Figure 4: Diagram of Glasses, Smith's *Instructions*, 1826

Philadelphia" [1], a position he held until 1853. He then became a brick maker. He is listed for the last time in 1858 as "salesman and steam brick press." [2] He died in 1872 at the age of seventy-five.

The glasses in Smith's Grand Harmonicon were pretuned—no water tuning necessary. They were also essentially wine-glasses (blown specifically for the instrument) except that the glasses had no feet—the stems were fit into the sounding board. A case for the sounding board and glasses was available for an extra charge.

Smith's earliest harmonicons, dating around 1826–1828, had square cases, and twenty-five goblets arranged in the following manner:

Observe that all the diatonic ("white") notes are in the 4 x 4 lower-left square, and the accidentals (the "black keys") are across the top and down the right.

[1] *Matchett's Baltimore City Directory* (1835–6) Baltimore, v.21, quoted in Ervine (1975), p.12

[2] *Wood's Baltimore Directory* (1858-9) Baltimore, v.33, quoted in Ervine (1975), p.12

Bruno Hoffmann and his Glass Harp

(1913–1991). German player and maker of the glass harp (a name which he coined)—essentially a set of musical glasses where the glasses are made and ground to pitch so as not to require water tuning. Not only does this simplify setup, but water in the glasses dampens the sides and interferes with the tone. Without the tuning water the sound is much clearer. (Try it! As you increasingly add water, the sound becomes increasingly muffled.)

Hoffman especially deserves mention because he almost single-handedly revived interest in the glass armonica literature—by performing it on his glass harp!

Having studied the piano, the organ and singing, he specialized from 1929 in the glass harp. He constructed a chromatic instrument with a compass of four octaves and developed an impressive technique in playing on it. He became known as a soloist in the 1930s, and was first heard in London in 1938. Hoffman was heard again in London in the 1960s, and in many other cities all over the world.[1]

Various Musical Glasses Players

We conclude our treatment of the Musical Glasses with a quick survey of other musical glasses players:

Mr. Cartwright

A certain Mr. Cartwright (his first name is a mystery) performed on the musical glasses in London in April, 1783. The British Museum possesses a handbill, on which

> Mr. Cartwright respectfully acquaints the nobility and gentry that he has taken Mr. Sechard's convenient rooms at no. 115 Pall Mall, next to Carlton House, where, in a style peculiar to himself, he will perform on the Musical Glasses. . . . The

[1]King, Alec Hyatt, 'Bruno Hoffmann', The New Groves Dictionary of Music and Musicians, 2nd ed.; ed. Sadie & Tyrell; Vol. ??? p.585. See also Hoffman's autobiography: Ein Leben für die Glasharfe; 1983; 1983; Helmut Michel "Unser Niederland", Backnang; ISBN 3923947062 and Appendix A.2 of Guignard (2002-03)

> reception he met with at Bath, and the persuasion of those people of fashion, who countenanced him there, have encouraged him to exhibit in the Metropolis. The dulcet tones, in imitation of the human voice, and soft notes of harmony, which have gained an admirer in every person who has honoured the performance, are the recommendation on which Mr. Cartwright rests for public support.. . . It having been thought that the Musical Glasses would not admit of great execution, Mr. Cartwright (hopes not presumptuously) takes the liberty of informing the public that he plays Fischer's favourite minuet, with all its variations, and several others, no less difficult, which were never attempted by any other performer in public, on the glasses. [1]

On February 1st, 1787, Cartwright returned to Bath, as advertised in the *Bath Chronicle*:

> Upper rooms. By desire. Mr. Cartwright's Public Breakfast will be on Saturday the 3d of February, 1787, attended with French Horns, Clarionets, etc. After breakfast Mr. Cartwright will perform on his new-invented grand set of musical glasses, several favourite compositions of Handel's Fischer's and Shield's etc. [2]

A second advertisment, of February 22nd, repeats the sentence "The dulcet tones. . . " from his London announcement of 1783, and adds the following: "He also constructs this melodious apparatus for sale. Terms for instruction, 3 lessons for one guinea, one guinea entrance." Apparently Cartwright continued to tour for some time, for in an 1827 encyclopedia, the article on the "Harmonica" includes:

> Some readers will recollect the performance of Mr. Cartwright a few years ago in different parts of Britain. In the latter case (i.e. Cartwright's as contrased with the harmonica proper) the glasses are arranged in a frame or box.[3]

[1] Quoted in King (1946) p.116

[2] Quoted in King (1946) p.116

[3] "Harmonica", *Encyclopedia Edinensis* (1827) vol. 4, p.103; quoted in King (1946) p.116

Cullen

Dr. Edmund Cullen of Dublin, who lived in the second half of the eighteenth century, was another performer on the musical glasses. He used thirty-five glasses, arranged in a special way to facilitate playing, and used a dampening device to prevent prolonged vibration. He claimed that his improvements made his instrument fully the equal of Franklin's armonica, and seems to have enjoyed considerable popularity in Ireland. Cullen claimed to have heard Fischer's celebrated rondo, Vivaldi's fifth concerto and music by Giardini played with ease and clarity. [??? Full details are given after the reprint of Franklin's letter in the Encyclopedia Britannica, third edition.]

An Edmund Cullen is listed as President of the *Kings and Queens College of Physicians* in Ireland in 1787.

Dr. Edmund Cullen also published a book: *Physical and chemical essays; translated from the original Latin of Sir Torbern Bergman, ... By Edmund Cullen, M.D. ... To which are added notes and illustrations, by the translator. ...* in two volumes, in 1784.

J.E. Franklin

No relation to Benjamin. J.E. Franklin published an *Introduction to the Knowledge of the Seraphim, or Musical Glasses* in 1813. It was a method for playing thirty upright glasses, and includes a selection of popular songs. He also offered Seraphims (musical glasses) for sale, and elicited a comment from a reviewer in the *Gentleman's Magazine*[1]: "We think 15 gns not a very moderate price for this fragile instrument."

The glasses continued to be popular throughout the nineteenth century. Scholes[???] records that in 1823 one Edwards

> with two colleagues, gave performances in Scotland on a set of over 120 glasses, the largest of which held three gallons and the smallest of which was the size of a thimble, the whole providing a six octave scale.[2]

[1] vol.84, part 1, p.372

[2] Quoted in King (1946), p.118

Around the middle of the nineteenth century there was a clergyman by the name of Rev. Thomas Jessop, Rector of Wighill in Yorkshire (from 1830 to about 1860) of whom it is recorded[1] that he was

> a man of prodigious learning, well read in Hebrew, Syriac, Arabic, besides Latin and Greek. He was a good mathematician, had a knowledge of chemistry, played well on the violin. When he held an evening service in his house, he would accompany the singing by playing on musical glasses. [2]

Other Musical Glasses Players

In Stainer and Barrett's *Dictionary of Musical Terms* (1888)[3] we read in the entry for "Musical Glasses": "The instrument has been recently revived under the name of Copophone". [4] WHY? Was there someone named Cope? Was it a trade name? We may never know. . .

As time goes on, new names (why?) for the musical glasses seem to get stranger and stranger. In the *Musical Times* in 1901[5] we read:

> You probably refer to the "Crystalphonicon," a species of musical glasses upon which a Mr. Arthur Lincoln, from New Orleans, performed, some thirty years ago, in London. He played on the glasses with his right hand and accompanied himself on the pianoforte with his left.

But Scholes quotes in his *Companion*[6] what has to be the all-time record for the strangest and longest name for any musical instrument:

> [The musical glasses have] the distinction of having had attached to it the longest section of the Greek language ever attached to any musical instrument, for a reader of the *The Times* wrote to that paper in 1932 to say that in his youth he had heard a performance the advertisement of which styled the instrument the *Hydrodaktulopsychicharmonica*.

[1] R.W. Hiley's *Memoirs of Half a Century* (1903); London; p. 313–4
[2] Quoted in King (1946) p. 119
[3] Stainer (1888)
[4] Quoted in King (1946) p. 119
[5] vol.42, 1901, p.126
[6] Scholes (1970)

Part V

Benjamin Franklin and the Glass Armonica

Franklin and Electricity

Benjamin Franklin (1706–1790) was born in Boston, the 12th of 13 children. His father was a candle/soap maker, and expected Benjamin to follow in that trade. Consequently Benjamin only received two years of formal schooling.

Apprenticing Benjamin to be a candle/soap maker didn't go well. Finally, in exasperation, Benjamin's father decided to apprentice him to Benjamin's older brother James, the printer. The rest, as they say, is history. By 1748, at the age of 42, Franklin was financially successful enough to retire from business and devote himself to science and politics.

In 1751 he published his celebrated *Experiments and Observations on Electricity*, in London. Franklin's ideas were welcomed in Italy. In 1755 Francesco Algarotti wrote to a friend:

> Behold from English America there come to us not only tobacco and indigo, but also philosophical systems. From Philadelphia a Quaker has sent us the most beautiful observations, the most beautiful reasonings in the world on electricity; and all our European electricians must doff their hats to this American.[1]

Two years later Algarotti wrote another letter:

> Who ever would have believed a while ago that England, which was reputed to be a country of louts, would excel so and legislate in matters of science? . . . Father Beccaria, with the most elegant and decisive experiments, is engaged in illustrating the system of Franklin; and Italy confirms more and more the laws of English electricity.[2]

Franklin's ideas didn't receive quite so warm a welcome in England or France. Not that Franklin didn't have staunch supporters in both countries from the beginning. But the British were inclined to look upon their colonials as semi-barbarians, and later as traitors. The French were more cordial, and it was the D'Alibard translation of Franklin's

[1] quoted in Pace, 17
[2] quoted in Pace, 17

works that “broke the English boycott” and brought Franklin’s name to universal attention. But France was more accustomed to originating new ideas herself than receiving them from foreigners, and Franklin’s ideas did arouse some resentment as a sort of threat to the French national pride. “This spirit of injured pride found its least inhibited expression in the antagonism of the huffy royal preceptor, the Abb Jean Antoine Nollet, who was reluctant to surrender a reputation freshly won with a plausible theory of effluvia to account for the action of electrified bodies.”[1] At first Nollet thought that Franklin’s discoveries were a hoax by his enemies. When the reality of the threat to his prestige became clear, he counterattacked with a volume of nine Letters on Electricity (Paris, 1753). Six of the letters were destructive criticism addressed directly to Franklin. “Around Nollet rallied a formidable party of anti-Franklinists who, by virtue of the royal patronage enjoyed by their leader, exercised considerable influence in the schools and in the Royal Academy of Sciences, acting thereby as a strong obstacle to the acceptance of Franklin’s ideas.”[2]

Italy, however, had no such prejudices. Except in music, the Italians had no particular pretensions of superiority. The various wars of succession in Italy had come to an end with the treaty of Aix-la-Chapelle, so from 1748 until the peninsula was caught in the maelstrom of revolution after 1795, the prevailing atmosphere was one of peaceful reform and accelerating intellectual activity. The sciences in particular profited from this improved environment. So it’s not surprising that the Italians were stirred to immediate action by the news of the successful outcome of the experiments by D’Alibard and de Lor in May 1752, which established the fact of atmospheric electricity (lightning) in accordance with Franklin’s theories. At least four Italians corroborated the experiment before Franklin set up his own lightning rod in September of that year.

One of them was Father Giambatista Beccaria (1716–1781), Professor of Experimental Physics at the University of Turin. His observations began on July 2 of that year, with a conductor erected on his own home. By the first week in August he had proved beyond doubt that clouds can be charged positively as well as negatively, an observation Franklin

[1] Pace, 18
[2] Pace, 18

did not make until the following spring, and which he hesitated to announce until after the appearance of Beccaria's first book on electricity. Beccaria's Artificial and Natural Electricity, published in Turin in 1753, "a most systematic exploitation of Franklin's germinal ideas conducted according to mathematical expository method and bolstered with ingenious and meticulously controlled experimentation, gave the status of science to what had been in the main the amusement of dilettantes and the baggage of charlatans. Its author was immediately acclaimed as the leading electrologist by all the fair-minded, including Franklin"[1] Franklin's opinion of Beccaria's book was that it was "one of the best pieces on the subject in any language."[2] And Beccaria's exhaustive experimentation made him an authority on the subject second to no one. Franklin was definitely at a disadvantage defending his ideas, being on the wrong side of the Atlantic, and increasingly involved in political matters. He could hardly have found a better champion for his theories than Beccaria, who devoted the rest of his life to promoting and extending Franklin's ideas on electricity, and to defeating all challengers.

By 1757 Franklin and Beccaria were corresponding—an exchange which continued for a quarter of a century until Beccaria's death. Franklin never ceased to feel that he owed Beccaria a profound debt of gratitude. And Franklin's recognition benefited Beccaria in turn: "so delighted was Beccaria's sovereign for the recognition accorded his subject [by his association with the famed Franklin] that he immediately increased his stipend, awarded him a pension, and 'in a thousand other most gracious ways manifested how great was his appreciation.'"[3]

Meanwhile, the practical application of his electrical ideas—the lightning rod—wasn't immediately embraced with open arms either. One group that opposed them was essentially superstitious: lightning rods were "thwarting God's will"; holy water and the ringing of church bells were the only unsacrilegious defense against lightning. The other group objected on a more scientific basis: the Marquis Chigi, for example, maintained that "electricity does not exist in the natural state, that lightning is not at all an electrical phenomenon, that pointed conductors can in no way keep lighting from forming, and that they are of no

[1] Pace, 20–21
[2] Quoted in Pace, 53
[3] Pace, 55

use in receiving and dispersing strokes."[1]

Matters came to a head when the Grand Duke ordered lightning rods to be placed on the cathedral and the Gothic tower of the city hall in Siena. Hot controversy divided the citizens of the little medieval city, with the Marquis Chigi on the one hand and the university professors on the other. "Once the rod was up," according to a contemporary report, "one can say that never was a wedding day awaited with so much anxiety as was a storm by the two parties."[2] Fortunately they didn't have to wait long. A colleague at the University of Siena describes the spectacular event:

> It will not be easy to find a similar observation attested in all its circumstances by a large number of people, who, in a thickly frequented public square, in plain daylight, and with all their attention, had their eyes turned toward an extremely high tower to observe the action of the conductor recently placed upon it, and who, without a long wait, had the fortune to admire, to the glory of Philosophy, the intelligence and the genius of the immortal Mr. Franklin, who, extending, so to speak, his prodigious hand over the square of Siena on the 18th of April, took by the hair a horrible lightning bolt and forced it to pass along a route mapped out by his great mind, with express orders not to damage a building on which it has so many times vented its furious strength. The people of Siena, always grateful to one who does good to humanity, are surprised that statues have so often been raised to those who have ruined cities and that they are so seldom raised to those who preserve them. If Mr. Franklin reads the present account, he will surely feel an ineffable consolation upon hearing about his fine triumph and the applause given to him by people so far from his country, who see in his marvelous lightning rod the most distinguished trophy of his immortal genius.[3]

One of Franklin's lifelong dreams was to visit Italy, and Beccaria—a visit that never happened. [Pace, 10] Neither would Beccaria's king

[1] Pace, 28
[2] Quoted in Pace, 29
[3] Quoted in Pace, 30

permit a visit to Franklin in Paris during the American Revolution—apparently afraid he would 'take a liking to American maxims'.[1]

Franklin Invents the Glass Armonica

From 1757 to 1762 Franklin lived in London, lobbying Parliament on behalf of the Pennsylvania colonial legislature. His experiments with electricity had already made him famous in the scientific community, and the candle/soap maker's son had reached the top of the political and social scene as well.

Franklin was keenly interested in music and had an extensive knowledge of it. He loved to sing, to write new words for old songs, played several instruments, including the harp and the viol da gamba as a capable amateur[2], and surrounded himself with music wherever he lived. His tastes were for 'simple music', Scottish airs in particular, and one of his letters is a rather scathing attack on Handel arias.[3] He also wrote a treatise on music theory[4], and apparently composed a string quartet.[5] On the other hand, Franklin apparently had little use for professional musicians (an attitude shared by the colonists in general): to illustrate social parasitism, he could think of no better symbol than a "fiddling man," whose activity results in no tangible product-bricks, for example—so that either the poverty or the labor of the rest of mankind is increased.[6] During his first trip to France in 1767, he was more interested in the means the French used to ventilate their theaters than in the performances.[7] Franklin also printed sheet music in his print shop.[8]

---

[1] Pace, 69

[2] Lemay, 293

[3] PBF XI, 539ff: before 1765 to his brother Peter Franklin

[4] PBF XII, 162ff: June 2, 1765 to Lord Kames

[5] Grenader, M.E., "Benjamin Franklin's String Quartet", Early American Literature, 7:2 (1972:Fall) p.183. Franklin scholars disagree whether Franklin actually wrote the quartet in question. Having seen the score and heard the work, it is definitely the sort of piece a very intelligent person without formal musical composition training might write.

[6] Pace, 268: ??? Smyth 9:246

[7] ??? Smyth 5:53

[8] ??? H.R.Marraro, Italian Music and Actors in America During the Eighteenth Century, Italica 23: 104, 1946

Franklin attended concerts frequently. One was a charity performance of Handel's Messiah at which Handel himself had been scheduled to perform (May 3, 1759), but Handel inconveniently died on April 14. The concert was conducted instead by Handel's protg John Smith, and still raised over £400.[1] In France in 1781 Franklin attended a concert in which he narrowly escaped death when the opera house caught fire and burned.[2]

Another less hazardous concert was by Edward Delaval on the musical glasses, probably in 1761, and Franklin decided to invent a more convenient arrangement of the glasses. [3]

It's no surprise that he devised an elegant design that simultaneously eliminated the water tuning (and the problem of constant evaporation), increased the playability and reduced the size of the instrument. He eliminated the water tuning by having each glass made with the correct size and thickness to give the desired pitch without being filled with any water, and made the set of glasses more compact and playable by nesting them inside each other, mounted on a spindle which was turned by a foot treadle.[Except during thunder storms, when Franklin would hook a kite up to his armonica! ¡wink!¿]

Franklin contacted Hughes and Company, at the Cockpit Glasshouse, and received the services of Charles James, who made the glasses for the first instrument.

---

[1] PBF VIII, 339, footnote

[2] Lemay, 292

[3] It is not entirely certain just when Franklin devised the armonica, had his first instrument made, and began to play it. The evidence is strong, however, that these events took place at least as early as 1761, and by early the following year a protegeé, Miss Marianne Davies, ¡pg.119¿ was giving public performances. On April 13, 1761, Thomas Penn wrote Governor Hamilton that BF was spending his time "in philosophical, and especially in electrical matters, ... and musical performances on glasses," but these words could refer to his preliminary efforts on water-tuned drinking glasses before he had fully worked out the idea. Penn Papers, Hist. Soc. Pa. Clearer evidence is found in a diary entry of Dr. William Stukeley, May 22, 1761: "Visited Dr. Franklyn, the electric genius. He has made a dulcimer of wooden sticks, very sweet; another of glass bells, that warble like the sound of an organ." The Family Memoirs of the Rev. William Stukeley, M.D. (Publications of the Surtees Society, LXXX), III 480. The term "glass bells" makes certain that BF was here using something quite different from drinking glasses, and "warble like the sound of an organ" shows that he was not striking them with sticks or small hammers. The instrument had certainly passed the experimental stage well before the end of the year. (PBF X, 118-119)

Franklin's new invention was announced in the Bristol Journal for January 12th, 1762:

> The celebrated glassy-chord, invented by Mr. Franklin of Philadelphia: who has greatly improved the musical glasses, and formed them into a compleat instrument to accompany the voice; capable of a thorough bass, and never out of tune. Miss Davies from London, was to perform in the month of January, several favourite airs, English, Scotch and Italian, on the Glassychord (being the only one of the Kind that has yet been produced) accompanied occasionally with the voice and the German Flute.[1]

Thus Franklin's initial name for his invention was the 'glassy-chord', a good, stout, practical English name. Its first public performance was by Marianne Davies, whom we shall consider shortly.

Franklin made plans to visit Italy—in part to visit his good friend Beccaria. But the visit wasn't to be. On 13 July 1762, a month before sailing from England to terminate five years of service as colonial agent for the Province of Pennsylvania, Franklin took quill in hand to bid farewell to friends whom he could not see in person. Among them Father Beccaria[2]:

> London,
> July 13, 1762
>
> Reverend Sir,
>
> I once promised myself the pleasure of seeing you at Turin, but as that is not now likely to happen, being just about returning to my native country, America, I sit down to take leave of you (among others of my European friends that I cannot see) by writing.

Franklin thanks Beccaria again for his work on electricity. He then turns his attention to the main topic of the letter: the glass armonica:

[1]Quoted in PBF X, 119, fn. The editors of PBF have been unable to find any copy of the Bristol Journal for the appropriate period or to determine from which London newspaper the item might have been taken.

[2]the complete letter can be found in the appendix[???]

> Perhaps, however, it may be agreeable to you, as you live in a musical country, to have an account of the new instrument lately added here to the great number that charming science was before possessed of: As it is an instrument that seems peculiarly adapted to Italian music, especially that of the soft and plaintive kind, I will endeavour to give you such a description of it, and of the manner of constructing it, that you, or any one of your friends may be enabled to imitate it, if you incline so to do, without being at the expence and trouble of the many experiments I have made in endeavouring to bring it to its present perfection.
>
> You have doubtless heard the sweet tone that is drawn from a drinking-glass, by passing a wet finger round its brim. One Mr. Pockeridge, a gentleman from Ireland, was the first who thought of playing tunes, formed of these tones. He collected a number of glasses of different sizes, fixed near each other on a table, and tuned them by putting into them water, more or less as each note required. The tones were brought out by passing his finger round their brims. He was unfortunately burnt there, with his instrument, in a fire which consumed the house he lived in. Mr. E. Delaval, a most ingenious member of our Royal Society, made one in imitation of it, with a better choice and form of glasses, which was the first I saw or heard.

If Delaval was the 'first I saw or heard', Franklin must not have attended any of Ann Ford's notorious performances in London in 1760 and 1761. Franklin continues. . .

> Being charmed by the sweetness of its tones, and the music he produced from it, I wished only to see the glasses disposed in a more convenient form, and brought together in a narrower compass, so as to admit of a greater number of tunes, and all within reach of hand to a person sitting before the instrument, which I accomplished, after various intermediate trials, and less commodious forms, both of glasses and construction, in the following manner.

Franklin concludes the letter:

> The advantages of this instrument are, that its tones are incomparably sweet beyond those of any other; that they may be swelled and softened at pleasure by stronger or weaker pressures of the finger, and continued to any length; and that the instrument, being once well tuned, never again wants tuning.
>
> In honour of your musical language, I have borrowed from it the name of the instrument, calling it the Armonica.
>
> With great esteem and respect, I am, Etc.
>
> B. Franklin

Here Franklin called it the "armonica", after the Italian for "harmony" which is *armonia*.

It is curious that Franklin chose to unveil the new instrument as he did, communicating to an Italian and baptizing it with an Italian name, after it had become known about London as the "Glassy-Chord". Furthermore, the correspondence between Franklin and Beccaria before and after the armonica letter contain no other comparable departure from scientific and personal matters. Yet Franklin was nothing if not practical. He was convinced that the armonica was an important addition to the family of musical instruments, perhaps destined to supersede the harpsichord and piano.[1] As previously with his stove and lightning rod, he must have been anxious to see humanity blessed with the new invention as soon as possible. "That intent could obviously be no better served than by having his instrument adopted and cultivated in the land that was the musical Mecca to which the western world still turned for diversion and instruction. What then more logical than for him to dedicate his new instrument to a prominent Italian in order to take advantage of Italy's musical hegemony? An Italian name for the invention, along with a national compliment or two for good measure, was probably calculated to contribute further to put the Italians in a receptive mood."[2]

??? Beccaria did nothing with Franklin's invention. Davies tour Italy in 1770

[1]Pace, 273: BF Memoirs, 422 (nothing there!?!) ???
[2]Pace 273–4

The earliest known appearance of the name "armonica" is in an advertisement in *Jackson's Oxford Journal*, May 29, 1762:

> The Armonica. Being the musical glasses without water, formed into a compleat instrument capable of a thorough bass and never out of tune, made by Charles James, of Purpool Lane, near Gray's Inn, London. N.B.—The maker is the person who has been employed in the management of the Glass Machines from the beginning, by the ingenious and well-known inventor, which are on the same principles and guided by the same hand as that played on by Miss Davies at Spring Gardens, London, at Bath and Bristol. [1]

Further, in the biography prefixed to Sparks's Works of Benjamin Franklin (London, 1882, vol.1, p.264) we read that the instruments were manufactured in London at the price of forty guineas.[2] [3]

Apparently having James make his first instrument hadn't gone smoothly, because when Franklin went back to the Cockpit Glasshouse to build another instrument, he asked for another glassblower. A Mr. Barnes was selected to try his hand, and he provided Franklin an "improved version" of the glasses, which were worthless for Franklin's purposes. Meanwhile, in June 1762, James went into business for himself. He took out an ad in the London Journal[4], in which he called himself "the Maker who has been employed by the Gentleman who is the real inventor, in the first ever made in England, and continues to be honored with his approbation".[5]

Franklin was unhappy with the situation, but was consumed with his

[1]??? Quoted in King (1946) p.107–108. *The London Chronicle*, June 17–19, 1762, carried a similar advertisement by James in which he explained that the armonica "may be so constructed, as to be either a Portable Instrument, or Genteel Piece of Furniture." (PBF 10:118)

[2]??? King, A.H. 'Musical Glasses and Glass Harmonica, p.107ff

[3]A guinea was L1-1s-0d (which is L1.05). It was considered a more gentlemanly amount than £1. You paid tradesmen, such as a carpenter, in pounds but gentlemen, such as an artist, in guineas. It was a tradition in the legal profession that a barrister was paid in guineas but kept only the pounds, giving his clerk the shillings. A guinea coin contained about .24 ounces of gold, making it worth approximately $US 125 (in 2006). Thus an armonica would have cost approximately $5000 in 2006 US dollars.

[4]London Chronicle, June 17-19, 1762 ???

[5]Becker, 20

impending departure for the Colonies (Sept. 1762) and had no time to correct it. Writing to Polly Stevenson from Philadelphia, March 25, 1763, he expressed his regret that James, already flagging in production, was "dilatory," and then commented:

> I was unlucky in both the workman that I permitted to undertake making thos instruments. The first was fanciful, and could never work to the purpose, because he was ever conceiving some new Improvement that answer'd no end: the other is absolutely idle. I have recommended a number to him from hence, but must stop my hand.[1]

Complaints continued: in a letter to Francis Hopkinson, Aug. 15, 1765, Franklin writes:

> ". . . It vexes me to hear that Miss Kennedy's Armonica is so badly made . . . James is broke, as indeed his Head, if not his Neck, ought to have been, for serving her so basely, and abusing my Recommendation."[2]

When back in England in 1770, a friend asked Franklin about James' claim that he was the official builder. Franklin confirmed the claim to the extent that "James is the only workman here acquainted with such matters, and, a very negligent, dilatory man." James was "now unable to supply one of my friends because, awaiting the pleasure of Mr. James, at length, he [the friend] died suddenly." Franklin settled on sending instructions to persons interested in buying one.[3]

Meanwhile, when Jefferson (in Paris) inquired in 1787 of John Trumbull (in London) about an armonica [4], Trumbull replied:

> I am told the Harmonica is never made to exceed three octaves. For one of that kind Longman & Brodsip ask me thirty guineas. I will enquire further on this subject.[5]

Which would seem to suggest that Longman & Brodsip were stepping into the gap left by Charles James.

---

[1]???
[2]???
[3]???
[4]Franklin had returned to Philadelphia in ???
[5]Letters TJ 1787, 10/30

Nevertheless, nothing Franklin wrote between 1757 and 1762, no experiment he undertook and carried out, absorbed him more happily than his musical invention.[1] And apparently his daughter Sally learned to play as well, as a portrait of her playing the armonica was painted. Unfortunately, the painting has never been found.[2]

The Armonica: Franklin's Lifelong Companion

Franklin was doubtless proficient on his own instrument, "and often may have spent his leisure hours with playing on it Italian music of the 'soft and plaintive kind"'.[3] It may have even enticed him away from his duties as colonial agent for Pennsylvania, because a report to his Governor in the spring of 1761 said:

> I believe he has spent most of his time in philosophical, and especially in electrical matters, having generally company in a morning to see those experiments, and musical performances on glasses, where any one that knows him carries his friends.[4]

The earliest mention of BF's performance on the armonica after his return to Philadelphia is in a letter dated Dec. 3, 1762, from Mrs. Ann Graeme to her daughter Elizabeth, the girl William, Franklin's son, had jilted.[5] Mrs. Graeme had called upon the Franklins the day before (about a month after BF had arrived); although the situation necessarily involved considerable strain, "we appear'd to have a very easy afternoon," and at the caller's request BF gave her "a tune on the Harmonica."[6]

So it's unlikely that Franklin had another instrument made by American craftsmen when he returned to Philadelphia in 1762. This is confirmed by ongoing correspondence we have of him trying to get armon-

[1] Benjamin Franklin, Carl Van Doren, Penguin Books, NY, 1991, ISBN 0-14-016.95260-1 pg. 299

[2] PBF 13:523

[3] ??? Sonneck, Suum

[4] ??? Pace 273, Sparks 7:243 fn

[5] See PBF VII, 177ff

[6] Pennsylvania Magazine of History and Biography, xxxix (1915), 270-1

ica glasses from London.[1] Thus it would seem that Franklin brought his London-made armonica with him to Philadelphia. At the same time, Marianne Davies has an instrument with which she starts concretizing right away (we shall consider Miss Davies presently) which suggests that Franklin had a second instrument made before his return to Philadelphia.

The jewel of Franklin's house in Philadelphia was the music room, called the blue room, on the third floor. Graced with gilt carvings, an ornamental fireplace, and decorative chairs and screens, it featured Sally's harpsichord and Franklin's beloved glass armonica, whose ethereal sweetness was well-suited to the Scottish songs Franklin loved so well. Playing duets with Sally on the harpsichord was one of his greatest pleasures. Eventually the music room would boast a welsh harp, a bell harp, tuned bells, and a viola da gamba, all much used by his musical family.

> I play some of the softest Tunes on my Armonica, with which Entertainment our People here are quite charmed and conceive the Scottish Tunes to be the finest in the World. And indeed, there is so much simple Beauty in many of them, that in my Opinion they will never die, but in all ages find a Number of Admirers.[2]

He himself took great pleasure from playing his armonica; he carried one home with him when he sailed a few weeks after writing this letter to Beccaria, and always thereafter seems to have had one in his living quarters wherever he might be.

Franklin was much loved and enjoyed a lively social life in England and Europe. He usually brought his armonica along to parties. Apparently word about this got back to the colonies, much to the chagrin of Thomas Penn who wrote a report to Governor Hamilton complaining that Benjamin Franklin was happily spending his time in "philosophical matters and musical performances on glasses."[3]

There is a story printed in an early Irish musical dictionary of how, upon his return to America, while Franklin's wife was asleep, he went

---

[1] ???
[2] ??? Benjamin Franklin, December 11, 1763
[3] ???

up to the attic of his Philadelphia home and set up his armonica which she had not yet heard. Having set it up, he started to draw forth its "angelick strains". Floating down from above, these sounds were apparently so heavenly, that "his wife awakened with the conviction that she had died and gone to heaven and was listening to the music of the angels."[1]

When Franklin went to France in 1776, we know he left his armonica behind in Philadelphia: on 14 July 1778 Franklin's son-in-law, Richard Bache, reported on the state of his house following its occupation by a "rapacious" band of British soldiers. Even before listing the missing books and scientific equipment, Bache lamented that they had carried off "some of your musical Instruments, viz: a welch harp, bell harp, the set of tuned bells which were in a box, Viol de Gambo, all the spare Armonica Glasses and one or two of the spare cases. You armonica is safe."[2]

Meanwhile, we know that Franklin played the armonica for his friends in France—it's a mystery where this instrument came from. When he visited his beautiful friend, Madame Brillon, an accomplished musician and composer, she would accompany his armonica playing on the pianoforte. Its ethereal, haunting notes with a touch of melancholy made it a favorite at weddings. One author wrote, "The ear of a mortal can perceive in its plaintive tones the echoes of a divine harmony."[3]

Abbé Morellet enlivened their gatherings [w/Mesdames Helvévtius & Brillon] singing in French Franklin's favorite Scottish ballads while the Doctor accompanied him on the armonica. For a dinner in honor of Franklin held sometime around Independence Day, the abb toasted him in a highly complementary song of his own composition with a heady refrain: "Le verre en main / Chantons ntre Benjamin" ("With glass in hand / Sing to our Franklin").[4]

An inventory of Franklin's instruments at the time of his death includes a viola da gamba, bells, harpsichord, glass armonica, spinet, Chinese gong, and a "Glassichord". The reader will recall that the 'glassichord' was the initial name that Franklin gave to the armonica. Yet, clearly if

[1]???
[2]PBF 27:89
[3]???
[4]PBF 30, lxiii

the armonica has already been listed in the inventory, the glassichord must be a different musical instrument altogether. Therein lies a tale:

In the winter of 1784/85, a Parisian physician named Beyer approached Franklin with an idea for constructing a kind of glass xylophone, played by means of mechanical hammers controlled by a keyboard. Franklin must have been intrigued by the idea, and gave Beyer his endorsement. Beyer presented a prototype to the Acadmie des Sciences in the spring of 1785, and received an enthusiastic reception. He then reminded Franklin of his promise to give a name to what the inventor had been calling simply 'the instrument'. Ever frugal, Franklin found a use for his formerly abandoned name, christened it the 'glasschord', and purchased one to take home with him to Philadelphia. Jefferson saw the instrument a week before Franklin left France and found it charming. Its tone was exceptionally sweet, he said, and Jefferson only regretted that its three-octave range was too short.[1]

Franklin's famous Autobiography ends in 1757-three years short of his invention of the armonica. But we know from his outline for the rest of the book that he had planned on devoting a chapter to it.[2]

Franklin Uses His Armonica for 'Healing'

Benjamin Franklin himself, the inventor of the glass armonica, used his invention to heal the “melancholia” of Princess Izabella Czartoryska of Poland.

Here is her own account, written in 1772:

> I was ill, in a state of melancholia, and writing my testament and farewell letters. Wishing to distract me, my husband explained to me who Franklin was and to what he owed his fame Franklin had a noble face with an expression of engaging kindness. Surprised by my immobility, he took my hands and gazed at me saying: pauvre jeune femme ['poor young lady']. He then opened an armonica, sat down

[1] PTJ 8:263 ???
[2] Ferrand, 422

> and played long. The music made a strong impression on me and tears began flowing from my eyes. Then Franklin sat by my side and looking with compassion said, “Madam, you are cured.” Indeed in that moment I was cured of my melancholia. Franklin offered to teach me how to play the armonica—I accepted without hesitation, hence he gave me twelve lessons. [1]

??? Madame Brillon plays the armonica (Lopez, Claude-Anne; Mon Cher Papa, Franklin and the Ladies of Paris; Yale 1996; p. 83)

=== ??? Franklin, accompanied by Madame Brillon, did pay a visit to Mesmer (when???), but their purpose, it seems, was more musical than scientific-they were interested in the armonica Mesmer used for background music during his treatments. That the visit was somewhat strained, with the guests trying to keep the conversation on music, and the host trying to promote his medical theories, is reflectedby an exclamation of Madame Brillon in one of her several evocations of paradise—this one dated Nov. 1, 1779—“in heaven, M. Mesmer will content himself with playing the armonica and will not bother us with his electrial fluid!”[2] In 1789 BF & Mme. Brillon went to Mesmer’s house in Paris to hear him play. (PBF X,123 n). Franz Schubert played at a mesmeric session conducted by the painter Carolsfeld in 1825. [Horden, P. Music as Medicine, p. 328]

Attempts at Improving Franklin’s Invention

Water Trough

A trough was sometimes placed beneath the row of glasses. Many sources assert that this was to be filled with water so the glasses would remain constantly wet.[3]

[1] translated in Lipowski, Z. J. (1984), Benjamin Franklin as a psychotherapist: A forerunner of brief psychotherapy. Perspectives in Biology and Medicine, 27, 361-366. p.362

[2] (APS XLIII, 35) (Lopez, Claude-Anne; Mon Cher Papa, Franklin and the Ladies of Paris; Yale 1996; p. 170

[3] PBF X,124, Groves, etc.

As any armonica player can atest, however, keeping the glasses moist is simply not a problem. One good 'dip' at the beginning is sufficient for most pieces. For longer works like the Mozart Rondo, there are more than enough places where the armonica rests while the rest of ensemble keeps playing-in these 'rest' intervals the armonica has more than enough opportunity to remoisten the glasses-if needed. Furthermore, the left hand can re-moisten the lower glasses while the right hand keeps playing, and vice versa.

Singers figure out where to breathe, armonica players figure out where to dip. Nevertheless, non-armonica-players frequently assume that keeping the glasses moist must be a 'problem' that they must solve for us. One frequently proposed solution is to have the glasses rotate through a trough of water.

The problem is, as I've verified by trying it for myself—by mounting an armonica glass on a glass lathe, setting the speed appropriately, and then lifting a basin of water to immerse the rim to various depths—rotating a glass into a trough of water has exactly the same effect as adding water to a wineglass—it lowers its pitch. And since each glass on a glass armonica is a different size, each glass will rotate into the trough with a different depth, and will consequently have its pitch altered by a different amount. In other words, rotating several dozen armonica glasses (on a typical armonica) into a trough of water will result in musical chaos. All of this to solve a 'problem' which was never a problem in the first place.

Some might suggest the glass armonica maker have the glasses appropriately out of tune so that when the trough is filled, they are put back in tune. I can only say that:

- Only someone who has never tried to tune a set of armonica glasses could think that this is possible within the realm of sanity.
- The water level must be extraordinarily precise. Evaporation is unacceptable.
- Now we're right back to the water tuning issue that Franklin was trying to avoid.

There are indeed armonicas with a 'trough'. Might I suggest that the real purpose of the *empty* trough was to catch the inevitable water drips? *That* would actually be useful!

Keyboard Musical Glasses & Armonicas

We have already seen Ann Ford's discussing of adding a keyboard to the musical glasses. Several people tried to convert the armonica into a keyboard instrument as well. One of these was Francis Hopkinson, Franklin's Philadelphia friend, who wrote Thomas Jefferson in 1786 that he was working on the scheme and had "little Doubt of Success." Jefferson replied that if Hopkinson's project worked out "It will be the greatest present which has been made to the musical world this century, not excepting the Piano forte." [???] Later Hopkinson reported substantial progress, but for all his optimism and Jefferson's enthusiasm, neither this nor any other attempt to turn the armonica into a satisfactory keyboard instrument proved really effective. No armonica of this sort seems to have survived, even in a museum. (PBF X,124)

In 1785 the Count de Saluces in Turin wrote to Franklin announcing that his countryman Abb Perno had invented a keyboard armonica. In his reply of July 5, 1785 Franklin himself summarizes the difficulties of accomplishing this:

> When I was in London, about 12 Years since, Mr. Steele, an ingenious Musician there, made an Attempt of that sort; but the Tones were with Difficulty produc'd by the Touch from the Keys, and the Machinery in Playing made so much Noise and Rattle, as to diminish greatly the Pleasure given by the Sound of the Glasses; so that I think the Instrument was never compleated. The Dutchess of [Villeroy] at Paris about the same time endeavour'd to obtain the same End, and has not yet laid aside the Project, tho' it has not hitherto perfectly succeeded. Baron Feriet of Versailles, began to work on the same Idea about the Time I receiv'd your Letter; and as he is a very ingenious Man, and has a Hand to execute as well as a Head to contrive the necessary Machinery, I hoped soon to have given you an Account of his Success: but I begin to doubt it, as I hear nothing from him lately. In my Manner of Playing on my Instrument the Fingers are capable of Touch-

> ing with great Delicacy; and the Glasses turn so smoothly, that one hears no other Sound but that given by the Touch. If the Instrument of Abb Perno has the same Advantages, its being play'd with Keys gives it an undoubted Preference, and I should be glad to know the Construction.[1]

Others who attempted keyboard armonicas:

Who	When	Where	Ref.
Frick	1769?	Baden-Baden	van Heertum 22-2(1999), note 16
La Duchesse de Villroy	1775	?	PBF 22:49, fn. 2
Hessel	1785	St. Petersburg	Lütge, 99
Dussek	1785	?	Lütge, 100
Mueller	1788	Vienna	Lütge, 100
Roellig	1786	Berlin	Lütge, 100
Heinrich Klien	1798	Pretzburg	Lütge, 100
Bartl in Chemnitz	?	eastern Germany	Lütge, 100

As Lütge observes, "the keyboard armonica did not succeed despite the playing advantages, because the ethereal, penetrating sound was impaired. One wants the thrill, which the fingertips draw from the glasses. One remains with Franklin's armonica."[Lütge, 100]

E.Power Biggs (1906–1977), the famous English concert organist, also attempted a keyboard glass armonica. He was interested in Americana and musical technology, so when, in 1956, the 200th anniversary of Mozart's birth and 250th anniversary of Ben Franklin's birth coincided, Biggs decided to perform Mozart's music on Franklin's invention. Biggs was convinced that the Mozart works could only be played on a keyboard version of the armonica, and decided to perform the Mozart works on such an instrument for the anniversary.

Here follows an excerpt from E. Power Biggs, Concert Organist , by Barbara Owen (Indiana Univ Pr, 1987, pg. 106–111) that recounts the story of Biggs "keyboard glass armonica"...

> His voluminous correspondence and library research began early in 1955, and one of his first discoveries was that while Franklin's own keyboardless Armonica still existed in a Philadelphia residence, not one keyboard version or fragment thereof

[1] ???

survived anywhere. This, of course, was the instrument Biggs was most interested in, since he believed that the music by Mozart could not be played without a keyboard version. [NOTE: the author and other armonica players perform this piece on a Franklin-style (keyboardless) instrument on a regular basis.] When hopes of finding a restorable antique faded, Biggs persuaded the American Academy of Arts and Sciences to sponsor the construction of one, and the Academy in turn interested the Franklin Savings Bank in financing the project. One of the Academy's members, Harlow Shapley of the Harvard Observatory, caught Biggs's enthusiasm and became a willing accomplice to his research and fund-raising activities.

Work got under way in the spring of 1955, with the deadline for completion a year away. By November the glasses were finished, and Biggs and Schlicker [a preeminent organ builder] went to the Corning plant the following month to assist in their tuning. By January the glasses were being fitted to the mechanism in Schlicker's shop, and the problems began showing up. Corning's glasses seem to have been partly at fault. When Schlicker visited the original Franklin instrument in Philadelphia he found that the old glasses were thinner, especially in the treble, and thus easier to make speak. Corning's glasses were also somewhat irregular in shape. In addition, the rubber mounting turned out to be too soft and had to be replaced with wood; and it was discovered that the smaller glasses had to be rotated faster than the larger ones. Finding a suitable covering for the mechanical "fingers" that played the glasses from the keyboard also proved problematic. Wet pigskin and dry rubber gave the best (though slightly differing) effects, but neither was as good as human fingers. And of course there was that nemesis of all musical glasses, breakage. Biggs was still optimistic but, as he confided to John Burchard, president of the Academy, he was also "touching wood, holding on tight, and keeping my fingers crossed.

A concert featuring the new armonica and (fortunately, as it turned out) other instruments was scheduled for April 11, 1956 at the Kresge Auditorium of the Massachusetts Institute of Technology. By March 24 there was a note of urgency, even desperation, in Biggs's correspondence with Schlicker. Biggs had planned to come to Buffalo on the 28th "to record a few sounds" for a broadcast, but "as far as a fair chance for me to learn how to play the instrument-we're way past it!" The Academy wanted the instrument on hand by April 3 in order to unveil it to the press. If they could not have it by then, "the concert will have to take place without it, and our work will have come to nothing, for the anniversary occasion will have passed.

The instrument arrived in time, and the concert went on, a program of works by Franklin and Mozart, performed by Biggs, six members of the Boston Symphony Orchestra, and the popular tenor, Roland Hayes. Biggs wisely brought the Cambridge Portative [a small portable pipe organ], on which he played not only Mozart's Fantasia in F and four of the "Epistle" Sonatas, but also the armonica part of Mozart's Adagio and Rondo for Armonica, flute, oboe, viola and cello. Although Biggs gave a preliminary demonstration of the principle of "glass music" on eight tuned glasses, the armonica itself was used only for three "'Divertimenti"—a Minuet from an armonica tutor, an Irish folksong that had been a favorite of Captain Pockrich, and Mozart's short Adagio for Glass Armonica. The tone of the new armonica was wobbly and erratic, and was frequently accompanied by gratuitous squeaks and scrapes. As one of the students later observed, it "wasn't quite a flop, but almost!"

The discouraging performance at the concert may have had something to do with the Franklin Savings Bank's sudden loss of interest in the project, leaving the Academy and Biggs to hunt up a donor to make up the deficit caused by Schlicker's extra costs in trying to perfect the mechanism. Biggs and Shapely were discouraged, but not quite ready to give up. Just enough publicity had been given the experiment to generate requests from orchestras, chamber music groups, radio, and television for concerts involving the armonica. "Unfortunately", wrote Biggs to Ralph Burhoe, another Academy official, "in every case the answer has had to be no, because the one test of success is whether the Mozart Adagio and Rondo can be played on the Glass Armonica!" He still had hopes that it might be perfected, though, for, "It's certain that if the Glass Armonica were successful it would fill a unique niche, and have continuing interest and use over a number of years.

In the summer of 1956, Biggs received a request from his old friend Harold Spivacke of the Library of Congress for the use of the armonica in a December program linked to the Mozart/Franklin anniversaries. Biggs doubted that the instrument would be any improved by then and candidly outlined the problems: the glasses themselves were too thick and not perfectly circular, and more research was needed on the "finger" material. Between $3,000 and $4,000 (in 1956 US$) had already been expended on the instrument, and while the Academy hoped to coerce Corning into making a new set of glasses at no cost, Corning decided that it wanted nothing more to do with the project. The harpsichord makers Hubbard and Dowd suggested making a striking mechanism to operate the stationary glasses, but since the musical result would have been more that of a glassichord or celesta, this idea was quickly abandoned.

In a last desperate attempt to salvage the project, the armonica was turned over to a "think tank" of MIT engineering students. Concentrating first on sound production, the students found that their fingers, dipped in vinegar, still produced the best effect. Other substances and means of exciting the glasses, from violin bows to electronics, were tried without success. Nothing very conclusive emerged, and most of the students felt that the contraption was better as Franklin had left it, without the keyboard. One was optimistic enough to suggest that "With unlimited funds, it would serve the memory of Franklin well to establish a research project to investigate the use of different bowl and exciting materials and build an accurately engineered Armonica." But the "unlimited funds" were nowhere to be seen. In 1958, at Biggs's suggestion, Shapley approached Henry Ford

> II regarding the possibility that the glassblower at Greenfield Village might be able to produce better bowls than Corning had, but nothing came of that either.

In 1965, answering an inquiry from Leonard Labaree, editor of the Franklin Papers, Biggs gave a short and rather dispassionate account of the armonica venture. While the word "failure" was not in his vocabulary, Biggs did have to admit that "our experiment was quite inconclusive," and, with regard to his performance of Mozart's Adagio, K356, "one cannot claim that the tone did any sort of justice to the music." His vision of what might have been was still intact, though, and at the end of his letter he wrote, a bit wistfully,

> 'Mozart's Adagio and Rondo, K617, which we had hoped to give with such a flourish, was played on the flute stops of the organ. The sound of a delicate flute stop, incidentally, rather resembles that of a glass armonica. Though it lacks, of course, the effect of coming from nowhere, and the slow dying away into silence, which is a quite magical effect with the glasses.'

Part VI

Armonica Virtuosi

Marianne Davies

Marianne Davies was born in 1743/4; daughter of composer and flautist Richard Davies (d.1773), and elder sister of the better-known singer Cecilia Davies ("la Inglesina"). Both parents seem to have been musicians, the father-Richard (d.1773) a composer and flautist.[1]

Marianne taught singing to her younger sister Cecilia. By 1751 the family lived [2] in Longacre[???]. On April 30, 1751, at the age of seven, Marianne played a concerto by Handel on the harpsichord during her own benefit concert at Hickford's Great Room in Brewer Street[3]. She also sang some songs and played a concerto of her own composition on the German flute[4].

Again for her benefit, on March 19, 1753, this time at the Great Room in Dean Street, Soho, Miss Davies-announced as "A Child of Nine Years Old"—played a Handel concerto on the harpsichord. About this time two pieces by her proud father were published in London, entitled:

> Ye Sacred Muses now attend. A New Song. The Words by a Gentleman on hearing a little Miss perform on the Harpsichord and German Flute and Musick can charm the human heart. An Extempore Thought, on hearing the Performances of Miss Davies, a Child of Eight Years of Age, in the Great Room in Dean Street. Set . . . for the German Flute.[5]

The young prodigy continued to perform around London. There was another benefit concert for herself on February 28 1757, where she and her father played German flutes together, and she performed on the harpsichord. She gave another performance on April 22, 1757 where, announced as making her second appearance on any stage, she played the German flute, accompanying singer Mrs. Lampe.[6]

---

[1] Some say that Franklin was Marianne's uncle, but Franklin's family tree shows no such relationship.

[2] opposite the Golden Leg

[3] Highfill, 4:202

[4] at this time there were various configurations of holes and keys on flutes, the 'German flute' being one such configuration

[5] quoted in Highfill, 4:202

[6] Highfill, 4:202

Marianne would thus appear to have set out with the intention of becoming a singer, flautist and harpsichordist. This was all changed in 1761 when she encountered Benjamin Franklin and his glass armonica. She gave the world premier performance of Franklin's new invention in early 1762 (and thus must have had access to a completed instrument in 1761):

> The celebrated glassy-chord, invented by Mr. Franklin of Philadelphia: who has greatly improved the musical glasses, and formed them into a compleat instrument to accompany the voice; capable of a thorough bass, and never out of tune. Miss Davies from London, was to perform in the month of January, several favourite airs, English, Scotch and Italian, on the Glassychord (being the only one of the Kind that has yet been produced) accompanied occasionally with the voice and the German Flute.[1]

The first performance seems to have occurred on February 18, 1762 at the Great Room in Spring Gardens, when she also sang and played the German flute. These performances lasted through March 27, and on April 16 she did another benefit at Dean Street. In May she gave a series of concerts at the Gold Lamp in King's Square Court, Soho, where her family now lived. Throughout the next several years she and her father gave numerous concerts in Soho, including one at Spring Gardens on July 31, 1762 before "the Cherokee kings and the two chiefs." There were other concerts periodically at the Pillar and Gold Lamp in the Haymarket (where Ann Ford had performed in 1760) in August 1762 and from February 10 until August 13, 1763; and at the Swan and Hoop, Cornhill, from August 15 to October 7, 1763. By 1763 her younger sister Cecilia may have started performing.[2]

After a trip to Ireland with her family in the winter of 1763-64, Marianne resumed her performances at Spring Gardens and Cornhill in the summer of 1764.[3]

[1] Announced in the Bristol Journal for January 12th, 1762. Quoted in PBF X, 119, fn. The editors of PBF have been unable to find any copy of the Bristol Journal for the appropriate period or to determine from which London newspaper the item might have been taken.

[2] Highfill 4:202-3

[3] ??? how could they be in Ireland and London at the same time?

They visited Dublin in 1764.Pohl, *Mozart und Haydn in London* I:61

The Davies then traveled to Paris [1] and were again in Ireland for several months. They returned to London by June 1767, when they lived at Coventry Court, Haymarket, and gave concerts throughout the summer at various music rooms.

In the summer of 1767 Mary Rich (in Grosvenor Square, London) writes to Franklin (in London) that she has just heard that Miss Davies has been performing with great applause.[2]

On 10 August 1767 we hear that Marianne's "sister will sing some favourite airs from the operas of 'Artaxerxes' and 'Caractacus"', this being apparently the first time Cecilia had appeared in London. But prior to this the family had decided to try their luck on the Continent and had started to collect letters of introduction from the London acquaintances. These letters were found collected in a book owned by the Rackett family in London.[3]

The first eight contained in the book are from Joseph Baretti (1719–89), critic and miscellaneous writer, and are addressed to his relatives and friends in Turin and Leghorn, Genoa, Ancona, Venice, Verona, Bologna and Milan. From them we discover that "they are recommended me by my most worthy Friend Mr. Sam Johnson". Samuel Johnson (1709–1784) was one of England's great literary figures—it is not known how the Davies sisters came to be acquainted with him.

The ninth to the fifteenth letters of introduction are by no less than by Johann Christian Bach (1735–1782), the 'London Bach', son of the famous J.S. Bach and a noteworthy composer in his own right. J.C. Bach also taught composition to a very young Mozart. J.C. Bach wrote letters of introduction for the Davies to his two brothers in Germany: Karl Phillip Emmanuel Bach (1714–1788), the 'Berlin Bach', and Wilhelm Friedman Bach (1710–1784), the 'Dresden Bach'—also noteworthy composers in their own right) and to patrons in Italy.

Throughout these letters the emphasis is laid not only on the girls' musicianship but also on their good character and the Catholic faith.

[1] when??? See 'A. in France' also

[2] PBF 13: 548) ??? quote it

[3] Matthews, 150

There is no doubt that they were very much helped by fellow-Catholics, and their connection with Bach, the Mozarts and Mrs. Garrick was probably primarily through meetings at Catholic chapels in London.

Armed with these letters, in the fall of 1768 the family again went to the Continent, and in Vienna [??? double check] it was the introduction to Gluck (whom we met earlier as a performer on the musical glasses) which bore the most fruit, for the sisters were taken into employment by the Empress Maria Theresa and taught her daughters, among whom were three who became the queens: of France (Marie Antoinette), of Spain [???] and of Naples [???]. At Vienna the Davies sisters became favorites of society and often gave performances at the Imperial court.

In Vienna also the girls met the popular composer Johann Adolf Hasse (whom we'll consider in more detail later), who gave Cecilia singing lessons and set a cantata by Metastasio called *L'Armonica* for the sisters. The sisters lodged at Hasse's house.[1] This was perhaps the high point in the sisters' joint career: it was performed on June 27, 1769, on the occasion of the marriage of the Archduchess Amalia to Duke Ferdinand of Parma. In honor of the bridal couple the Italian librettist Pietro Metastasio, then court poet, composed an ode in Italian which Hasse set to music for soprano with armonica accompaniment, called, appropriately enough, *L'Armonica*. The Davies sisters rendered this composition apparently to the great satisfaction and approval of the assembled guests. Metastasio, in a letter dated 16 January 1772, described the beautiful tone of the harmonica and how Cecilia produced her voice so that it was indistinguishable from the instrument. Marianne seems to have remembered her benefactor Franklin, for a copy of the words-though unfortunately not of the score-survives among the Franklin Papers. (PBF X,123):

> Aah, why cannot I, too, Filomena, like you, weave with my song a sweet shackle for souls?
>
> If today any lip casts to the breeze harsh words, it is too bold; but if it is silent on such a great day, it is no less guilty.
>
> (Recitative:) Sister, be bold. Fit your skillful hand to the spinning crystals, and rouse their rare seductive harmony. I, too, with song shall try to imitate their amorous tenor. Who

[1] Pace, 277

could repress applause and good wishes, now that Amalia's languid, tenuous, plaintive tone of the new harmonic instrument give you pause. Leave to Mars his noisy trumpets, servants of his ire. More befitting to love is a sweet melody, provocative not of wrath, but of tender affections; better company it is to that calm light, the benign manner, the sweet majesty which are transfused from her fair soul over the countenance of the Royal Spouse. Although subdued, the style of our song will be pleasing to her; for the humble tone is not a sin or fault. And respect always speaks in humble tones.

(Aria:) In the season of flowers and fresh loves, pleasing is the soft breath of a light breeze. Whether it sighs among the leaves or slowly wrinkles the waves, a breeze is everywhere the companion of pleasure. [1]

---

[1] Ah perchè col canot mio
Dolce all'ame ordir catena,
Perchè mai non posso anch'io
Filomena, al par di te?
S'oggi all'aure un labbro spande
Rozzie accenti è troppo audace;
Ma se tace in di si grande,
Men colpevole mon è.
Ardir, germana: a' tuoi sonori adatta
Volubili cristalli
L'esperta man: e ne risvelgia il raro
Concento seduttor. Col cano anch'io
Tenerò d'imitarne
L'amoroso tenor. D'applausi e voti
Or che la Parma e l'istro
D'Amalia e di Fernando
Agli augusti imenei tuto risuona,
Saria fallo il tacer. Ne te del nuovo
Armonica strumento
Renda dubbiiosa il lento,
Il tenue, il flebil suono. Abbiasi Marte
I suoi d'ire minitri
Strepitosi oricalchi; ua soave
Armonia, no di sdegni
Ma di teneri affetti eccitrice,
Più conviene ad amor; meglio accompagna
Quel che dall' alma bella
Si trasonde sul volto

They left Vienna in October 1770 for Italy. The Mozarts were actually standing on the balcony of their lodgings when they saw the Davies family arriving in Milan. Leopold writing to his wife on 21 September [1771] said:

> A few days ago Miss Davies arrived here and drove past our house in the mail coach. I recognized her and she saw us, for we happened to be standing on the balcony. A few hours later I went to call on her at the 'Three Kings', which is not very far off, as I guessed that she would be staying there, since it is the most respectable inn. She, her sister, her father and her mother could hardly express their joy. I told their servant where Herr Hasse was staying and very soon his daughter appeared, who also was beside herself with delight, for they have been most cordial friends since they met in Vienna. They all asked for you at once and they send you their greetings. You will surely remember Miss Davies with her armonica?[1]

In December 1771 they went to Naples, where Cecilia was given a very prima donna role in an opera by Hasse. It seems that after this success the family returned to Rome.][2]

In a letter from Rome dated July 1772 to Sir Horace Mann we read:

> Sir,

All Sposa Real placido lume,
Il benigno cosume,
La dolce maestà. Benchè sommesso
Lo stil de' nostri accenti
A Lei grato sarà; che l'umil suono
Non è colpo o difetto;
E sempre in suono umil parla il rispetto.
All stagion de' fiori
E de'novelli amori
E grato il molle fiato
'un zeffiro leggier.
O gema tra le fronde
, O lento increspi l'onde;
Zeffiro in ogni lato
Compagno è del piacer.
(Translation in Pace, 356. Original Italian in Pace, 278–9)

[1] The Letters of Mozart and his Family, Anderson, 2nd ed. (1966) p.198

[2] Matthews, 160–161

> I have the honour of presenting to you the sisters Marianne and Cecilia Davies, your compatriots, both musical virtuosi, of whom one sings marvelously, the other plays the harmonica, an entirely new instrument, which corresponds well to its name, and which is unique to this young lady. The are making a tour of Italy in the company of their father and mother, and deserve by their abilities and their other virtues to be welcomed everywhere they go. They will certainly be well received in Tuscany if you will grant them, as I ask, the honour of your protection, of which they are worthy.[1]

In summer of 1772 they found themselves in Florence. On August 2 the archducal court was entertained by the two ladies, "One of whom distinguished herself in a concerto performed on an instrument of crystal made in London called the Armonico[sic]." For their efforts they were rewarded with a gold snuffbox and a watch and chain.[2]

By the end of 1772 the family was once again in Vienna, then returned to Italy in the spring or summer of 1773[3] and then back to London where Cecilia had accepted an offer to play Berenice in Sacchini's 'Lucio Vero' on November 20. Cecilia must have been singing with a broken heart, for their father died in December.

1778 found both the Davies sisters and Franklin in Paris. On January 29 1778 she sent Franklin this note:

> I hope you will Excuse the liberty I take in troubling you with this line but being come to Paris with my Mother and Sister on account of the latter's health, should think myself guilty of an unpardonable neglect were I not to take an opportunity of waiting on the ingenious Inventor of the Divine Armonica. My Sister continually expresses her infinite Obligations to You Sir, and as She is just at present able to go out is extremely desirous to have the pleasure of seeing you; but least we might happen to call at an inconvenient time I should Esteem it a particular favour could you let me know by the Bearer any moment tomorrow when you are at leisure, as we are

[1] Quoted and translated from French in Matthews, 162
[2] Pace, 289
[3] Matthews, 163

> very impatient to have the happiness of waiting on you. If not tomorrow, any other Day Except Saturday or Monday next.[1]

Marianne has health problems, Mother is still living. Franklin seems to have specified, "dinner Sunday evening", to which Cecilia replied the very next day:

> I should have been happy to the greatest degree in the honour of Dining with you Sunday, but to my misfortune since my Sister's late Illness she does not Dine from home; but I shall have the honour of waiting on you with my Mother and Sister Sunday afternoon if you will give us leave.[2]

Cecilia's professional life was on the rise, but as we just saw in Cecilia's letters to Franklin, Marianne is plagued by ill health. (Another note from Cecilia dated September 24th of that year would suggest that another get-together was in the offing.)

The Davies' situation has grown desperate. On April 26, 1783 Marianne writes from Florence a rather extraordinary letter to Franklin detailing their predicament and asking for a favor:

> Dear Sir.
>
> Notwithstanding I am at present a Being almost insensible to any Joy or Pleasure this miserable Life can afford, yet as I do still Exist, so do in me the strongest feelings of Gratitude, Respect, and Esteem, by which I must always be most sincerely attach'd to my ever dear and worthy Friend and Benefactor Doctor Franklin. . .
>
> Indeed since I had the pleasure of seeing You last, both my Sister and I have gone thro' a great deal of Grief and Trouble of various kinds. After having the Affliction to see our Dear Affectionate Mother suffer a long and severe Illness, we had the Misfortune to lose Her; which was a Grief almost too much for us to bear. Since that, I had a violent return of my nervous complaints which brought me so low that there were little hopes of my recovery. I was near a twelvemonth confin'd

[1] PBF 25:543
[2] PBF 25:550

> to my Room, and most part of the time to my Bed. You will easily imagine what anxiety of mind this occasion'd my poor Sister; whose greatest foible is-being too much attach'd to me. By this Illness of mine my Sister suffer'd much likewise in her Interests; for as she would not on any account quit me she was oblig'd to decline several advantageous Offers in her Theatrical Profession. Misfortunes generally follow one another. at least we find it so. A Person in whose hands my Sister and I had unluckilly plac'd our Money, fail'd. so that we have as one may say to begin the World again. And to compleat our bad Luck, Death snatch'd away a Sovereign at whose Court (had I not been too giddy and fond of travelling some few Years ago) we might have been happily settled and to Whom had Fate spar'd Her to us, we might have had recourse at any time; particularly in our present lonely Situation! The Great and Good Empress Maria Teresa would I am certain have even felt pleasure in taking into her Service those Orphans whose Parents as well as themselves She had formerly graciously deign'd to Patronize in a most particular manner. But She is gone! In short we meet with nothing but Losses and Vexation. so much so that for my part I am heartily disgusted of the World.

Marianne's "nervous complaints" which confined her to bed for almost a year, Cecilia's career compromised by caring for Marianne, both parents and their formerly generous patrons gone, and a major financial reversal—on top of the grueling demands of an ongoing concert career—life has been hard. In spite of all these calamities, Marianne is working on reviving her armonica career:

> I am destin'd to begin the World again, and that at a time when I did suppose my Career of Life was at an end. However since it must be so, I have once more got in practise of the Armonica, and make no doubt that if I could travel with it to different capital Cities and Courts as I have done before, 'twould be well worth my while: but unfortunately for me, my Situation is now so different to what it was then, that I dread undertaking to travel with that Instrument under my charge. Well I remember the difficulties and expence attending it and the perpetual fear of its being damaged at

> each Custom House &ca. &ca. Yet at that time I was happy in my poor Dear Father's continual care and attention. The Protection likewise of our Dear Parents made Travelling then appear to me quite in another light. How can I now think of roving in that manner from one Country to another with only a Sister so much younger than myself? Yet something I must do. and really when I consider that I have the Prerogative (thro' your goodness) of being the first public Performer on that Instrument; and that even yet, by all I can get information of, no one else has made much progress on it, tho' some attempt it; these reflections give me courage. Were I but in Paris under your Protection! Sometimes I have a mind to propose to my Sister for us to set off imediately towards Paris. but the knowledge I have of what one must spend in that City for Lodging, Living, &ca. &ca. and the inevitable Expence attending such a long Journey, soon deters me from proposing to undertake it merely upon Chance.

By the way, as we shall consider later, some have blamed Marianne's "nervous complaints" on playing the armonica. But as we can see, Marianne herself doesn't blame them on the armonica; she's even resuming practicing and planning on resuming her performance career. Perhaps she was simply severely depressed from the loss of both parents, her patrons, and her financial well-being.

Marianne has a specific proposal for Franklin:

> A Project however occurs to me, which if I have any good luck at all left, I should think might be brought to bear thro' your Interest. The Queen of France is fond of Music. A small Annual Pension from her Majesty would attach to her Service the Original Performer upon an Instrument, the Invention of which being superiorly perfect, renders it worthy the Patronage of that Sovereign. and particularly so as the Inventor is universally ador'd by the French Nation. Now if You Dear Sir will but interest yourself for me with your usual Benevolence, what should prevent this being granted?. . .

Nothing seems to have come of her proposal, however, for she sends another letter to Franklin in October 17 of that year:

> I made so free as to trouble You with some account of my present Situation, entreating your Advice but I am so unfortunate as never to have had any Answer. I have been and am still in the greatest Anxiety imaginable on this account and can only conclude that either the said Letter or your Answer must have miscarried: for surely had You received it, you would have favour'd me with a Line before now.

There is no record of a reply. Meanwhile, Marianne wasn't waiting for Franklin. Around May of that year she placed the following advertisement in the Tuscan Gazette:

> Marianne Davies, original player of the instrument of electrical music called the Armonica , in view of her imminent departure from this city, informs the public that those who wish to hear her in their homes can be served if they will give notice a day in advance.[1]

Notice the phrase "electrical music"—obviously Marianne was trying to capitalize on Franklin's scientific fame by implying a mysterious connection between his spectacular electrical discoveries and the eerie sound of the armonica. After all, the glass bells of the armonica somewhat resemble the apparatus used in electrical experiments.

Notwithstanding the 'imminent departure' that Marianne threatened in the above advertisement (around May 1783), they were still languishing in Florence in wretched circumstances during Lord Mount Edgecumbe's visit in 1784–1785. Finally the English colony in Florence, stirred to pity, staged a benefit concert whose proceeds enabled the two sisters to return to England.[2]

Now in London, by 1797 we find the sisters reduced to giving singing lessons to beginning students. The Rev. Thomas Rackett's mother writes in Jun 19, 1797:

> Miss Davies call'd on me and in the kindest manner assured me they took the greatest pleasure in instructing the dear Dorothea for they had it quite at heart, and was sure in a short time they should bring her out a little wonder to all

[1]Gazzetta Toscana, 1783:84, quoted in Pace, 280
[2]Pace, 280 See ???DNB 5:582

> your friends, that was their words, for which reason they wish'd no body to hear her yet, only they beg she may read music as much as she can.[1]

These singing lessons to daughter Dorothea blossomed into an abiding friendship with the Rackett family. In a letter dated September 4, 1813 Cecilia tells Mrs. Rackett that her sister is living with her but is in poor health.[2] The death of Mrs. Rackett seems to have brought the Davies sisters a small relief from money concerns: Dorothea Rackett, now Mrs. Solly, wrote to her mother in August 1824:

> Mrs. Domville thinks Miss Davis is right to spend Mrs. Garrick's legacy as long as it lasts since she cannot live upon air. When the money is gone she must trust to the kindness of her surviving friends who now that her necessities are made known will not leave her in absolute want but there is no necessity for her to—[illegible] and hoard however trifling as she has no one to provide for but herself; from the language of Lady Thorold it it is extremely probable that she and her sister will subscribe whatever may be necessary.[3]

From the phrase 'she has no one to provide for but herself' we must conclude that Marianne is now dead. Sources disagree on the year, but generally place her death around 1816–1819.[4]

Cecilia lingered in indigent circumstances and in poor health for another decade-modestly supported in her declining years by the National Fund and the Royal Society of Musicians. Writing on 17 January 1826 Cecilia tells Mrs. Rackett: "Every December brings to my recollection the great affliction which it pleased the Almighty to send me, and, which all my resolution can never get the better of God's will be done."

Lamenting the loss of her sister, Cecilia wrote on August 1, 1831:

[1]Letter from the Rackett's mother, from King Street, Covent Garden, on June 19, 1797. Quoted in Matthews, 150

[2]Matthews, 166

[3]Quoted in Matthews, 166

[4]Groves 1819; Highfill 1816(?); an obituary notice for Cecilia in 1836, the Musical World wrote that Marianne had died "almost 20 years ago" which would put her date of death after 1816 (quoted in Highfall, 4:203).

> But allass! I must now be satisfied with the Recollection of the pleasure I enjoyed in traveling as of a pleasing dream never more to be realised having for ever lost that Dear Companion my ever to be lamented Sister whose Society alone could make any spot of the Globe a Paradice to me but we must submit in every thing to the Will of the Almighty.[1]

Cecilia died in London on 3 July 1835, aged about 78. Her funeral was attended only by an old nurse and a servant.[2]

Concerning the fate of Marianne's instrument: *The Harmonicon* of August 1832 gives us a column about the lives of Cecilia and Marianne Davies, and mentions that the armonica "is still in good order, in the possession of a lady who was a favourite pupil of Miss Davies".[3] A letter from Mrs. Solly (neé Rackett) of February 5, 1835 says:

> Mr. E. Solly writes us word that Wheatestone is to lecture on Acoustics at King's College in London and wishes much to have the loan of the Armonica. I shall refer him to Miss [Cecilia] Davies as I cannot venture to lend it without her permission and he may as well call on her and it may be of some use to her.[4]

After this all trace of Marianne's instrument has been lost.[5]

P.J. Frick

Philipp Joseph Frick (1742–1798) was an organist, composer and noted performer on the glass armonica, who captivated audiences all over Europe in the eighteenth century, from Russia to London. As he described himself, "the Writer was (formerly) obliged to travel through the greatest part of Europe, and thus became known with his musical instrument Harmonica, almost to every Monarch and Individual."[6] He

[1]Quoted in Matthews, 168
[2]Matthews, 169
[3]Matthews, 168
[4]Quoted in Matthews, 168
[5]See Matthews, 169
[6]Frick, The True Knowledge (1797) 9

also composed and published works for piano/harpsichord and other instruments, and several books on music theory[1] A review mentions that he played one of his own compositions, so apparently he composed for it, alas none have apparently survived.[2] He also tried to add a keyboard to the armonica.[3] In 1797—a year before his death-he published his mystical religious magnum opus called *The True Knowledge of God and Man; of the Great Sabbath on Earth; and of the Restoration of All Things; With some Essential Remarks on the Duty we owe to our Creator*, generally now referred to (when referred to at all) as simply *The True Knowledge*.

Frick was born in Willanzheim, a village near Wrzburg in southern Germany, on 14 April 1742. He was the son of a Catholic schoolteacher in Willanzheim, Matthus Frick, and his wife Margaretha Zapff, who were married in the town of Willanzheim in 1736. Where the young Joseph Frick, as he was to call himself in later life, received his musical education is not known,[4] but he was apparently talented enough to rise to the position of court organist to August Georg, the Catholic Margrave of Baden-Baden, from 1762 until 1771, the year in which August Georg died.

In 1769 Frick traveled throughout Germany with his instrument, to-almost-general acclaim:

> Also, Frick is here, former organist at Baden, a traveling armonica player. He plays very badly, particularly miserable is his own composition; but the rarity of the instrument means that it requires mention.[5]

He performed in Frankfurt, for example, on September 16, 1769 and received a much happier review:

[1] *The Art of Musical Modulation* (1780; after *Ausweichungs-Tabellen*, Vienna, 1772), *A Treatise on the Thorough Bass* (c.1786) and *A Guide in Harmony* (1793)

[2] van Heertum 22-2(1999), note 14

[3] van Heertum 22-2(1999), note 16

[4] After training at a choir school he was probably apprenticed to a master, as musical training in Germany was regulated by musicians' guild. See Bukofzer, 404-407

[5] Auch ist hier Fricke, ehemaliger Hoforganist in Baden, ein reisender Spieler auf der Harmonika, einzuschalten. Er spielt zwar schlechnt, besonders ist seine eigene Composition Hoechst elend; aber die Seltenheit des Instruments macht, dass er Erwhnung verdient. van Heertum 22-2(1999), note 14

> Herr Frick . . . gave a concert on the armonica which he built himself. This instrument consists of pure glass bells, evoking such a fine and singing tone as has never been heard before in music.[1]

While in the employ of August Georg, the Margrave requested Frick to build an armonica, and the completed instrument seems to have pleased the prince. But he never was paid for it, as Frick himself recounts:

> From the year 1762 to 1771, the Writer was Organist to the Prince or Margrave of Baaden, for whom he was desired to make the said Harmonica, and for which purpose the then Court-Marshal Baron Schnau advanced the money. When ready, the Prince was indeed pleased with the Instrument: but the said Baron took back his money from the Writer's whole salary, which obliged him to leave that Court, and to travel-as mentioned above. [Frick, 9, the autobiographical passage is quoted in full in van Heertum 22-2(1999), 74-75]

Frick may have had the armonica built in Karlsruhe, where there was a glass armonica factory. Schmittbauer (whom we shall meet shortly) was Frick's superior at this post, and also apparently had his instruments made at this same factory.[2]

In 1771 the Margrave died. The catholic Margrave was succeeded by his cousin the Protestant Karl Friedrich von Baden-Durlach who joined the houses Baden-Baden and Baden-Durlach. In the merger, Frick found himself out of a job.[3] So he apparently toured Germany again: we know he gave a concert in Hamburg on February 8, 1773.[4] He then traveled to Russia, he lived in Moscow and fended for a living by advertising his talents in the local newspaper. In the Gazette de Moscou of April 1, 1774 he announced armonica performances on Mondays, Wednesdays and Fridays. On July 15, 1774, he again advertised in Gazette de Moscou to lovers of music that glass armonicas could be ordered from him. While in Moscow he lodged with an architect named Rosberg.[5]

[1] quoted from van Heertum 22-2(1999), note 15
[2] van Heertum 22-2(1999), 70
[3] van Heertum 22-2(1999), p.70
[4] van Heertum 22-2(1999), note 18
[5] van Heertum 22-2(1999), 71

Frick claims to have performed occasionally in the presence of Catherine the Great. In 1775 he was appointed piano teacher to Grand-Duchess Nathalie Alexeievna, first wife of Catherine the Great's son and successor Paul Petrovich.[1], and moved to St. Petersburg. When his highborn pupil died in childbirth in 1775, Frick was again left penniless and out of a job. Frick describes what happened:

> In Russia, he was (afterwards) music-master to the Grand Duchess. When She died, almost his whole salary, &c. was due to him, as likewise some presents for having several times played upon his Harmonica before the Empress: and to the honour of that Imperial Court be it said, both sums were ordered to be paid, but again, the Minister, (Nicolay Iwanowitz Soltikoft) withheld the money. On account of this second loss he [the writer] was obliged to travel still farther on, instead of returning to his original home; and though he never thought of coming to England, yet, two days before he intended to set off from Holland to the Southern parts, he was wonderfully directed to go to London (1778) at least for a few months.[2]

He left Russia for Germany in 1776 or 1777.

In 1764, established in his career as a court musician (as he thought) in the employ of the Margrave at Baden-Baden, Frick married Josepha Domini Fistler on 9 October 1764. The marriage was witnessed by Joseph Schmittbauer (whom we shall meet shortly). It's not known if Frick took his wife with him to Russia, but he must have left her behind in Rastatt, in rather poor circumstances, when he continued his travels after his return from Russia. The registers of the city of Rastatt in Baden list the wife of 'court organist' Frick, who received alms, wood and corn from the local alms fund from 1778 until 1782. The reason for the separation may be found in Frick's own commentary on Matthew 5:32: "It says, Man and Wife are not allowed to separate, except for adultery; forcible means, such as a soldier being sent abroad, or an absolute necessity to seek for bread, excuse the man likewise.'[3]

[1] Mooser, 2:127
[2] Frick, 9, quoted in van Heertum
[3] van Heertum 22-2(1999), 71

So, in 1778 Frick traveled to Holland. Originally planning to head south, Frick says (writing of himself in the third person):

> . . . though he never thought of coming to England, yet, two days before he intended to set off from Holland to the Southern parts, he was wonderfully directed to go to London (1778) at least for a few months.[Frick, P.8]

No surprisingly, things didn't initially go well for Frick in London either:

> But having been robbed there, in the first fortnight, of a valuable gold watch, and his whole property being lost soon after (which however he received again after ten months) he was certainly obliged to enter into business, (teaching the Harpsichord) in order to get again, if possible, the expence he had incurred during that time, and what he was robbed of. This restitution came, however, so slowly, that at last he grew too old for pursuing his travels; and lately he employed much time upon this present knowledge, whereby he neglected all opportunities for increasing his business; therefore he acquired till now (1796) no more than what enabled him (during these 19 years past) to pay-as he did-every day for what he wanted, without having been at any time indebted or troublesome to any person whatever.

So he pursued his musical career with some success, teaching the harpsichord and apparently giving performances on his glass armonica to London audiences to general applause. Reichardt, a fellow armonica virtuoso/composer, probably met Frick when he traveled to London in 1785, and reported that Frick was active as a piano teacher and had written several music compositions.[1] He must have had some reputation as a musician, as Haydn, on his first trip to London, lists Frick as a notable musician of his day.[2] He also dedicated one of his books to the Queen (perhaps in hopes of a reward) and may have been introduced to her—possibly after a performance.[3]

In 1779, a year after arriving in London, he joined the Masonic Pilgrim

[1]van Heertum 22-2(1999), note 25

[2]??? H.C. Robbins Landon, Haydn, Chronicle and Works, 5 vols, London 1976-1980. Vol 3, Haydn in England 1791-1795, p. 182 ???

[3]van Heertum 22-2(1999), 73

Lodge (now no. 238)—founded in that year specifically for the German-speaking community in London. Frick was not a founding member, but as its seventh member he was a very early one. Interestingly he listed his occupation as 'businessman', and not 'musician', for reasons that are not entirely clear. When he was admitted, he had the qualification 'Affil.' added to the date of admission, meaning he was already a mason, although it is unclear where in his travels he first joined. He was made the lodge's Director of Ceremonies from 1779 to 1781. He probably met Haydn and Reichardt-two visiting German musicians who were also masons. And Johann Christian Bach, Queen Charlotte's music master, was also a inducted into the Pilgrim Lodge in 1781.[1]

It's unknown how long Frick remained in the lodge. His interests were increasingly taking a millenarian turn. Much like our own recent "Y-2-K"—short for "Year 2-Kilo" (or thousand)—they were experiencing their own "Y-1.8-K" fever, many 'millenarian' groups expecting Jesus Christ to establish His 1000-year reign at the turn of the century. There was a tense social and political climate in both England and the Continent—everyone was on edge after the Reign of Terror in France, and prophecies abounded. "Pamphlets prophesying the end of time and the establishment of the New Jerusalem on earth, as envisioned by John in Revelations XXI.2, were printed in abundance in London."[2]

In 1795, a dramatic spiritual conversion appears to have urged Frick to observe a more retiring way of life, and in 1797 he published his *True Knowledge*, which promises to describe the great 'Sabbath on Earth', and is also intended to prepare mankind for the imminent coming of Christ. It was published by William Bryan, himself involved in millenarian circles at least since 1789, and Frick published his tract anonymously-perhaps a wise precaution considering that Richard Brothers, a prominent millenarian, had proved a sufficient threat to the authorities that they committed him to an insane asylum. (Brothers continued to publish from the asylum anyway.)[3]

Frick claims to be divinely inspired—like so many others inclined towards mystical theosophy. In *True Knowledge* he declares that he was favored by God to present to the world the true account of man's divine

[1] van Heertum 22-3(1999), 129-131
[2] van Heertum 22-3(1999), p. 132
[3] van Heertum 22-3(1999), p. 132

origin, so men might know and prepare for the coming of Christ: Christ has even revealed to the Writer the reasons why his Kingdom will be established upon Earth. This was, indeed, never before communicated to any person in the world; we may take it as proof that it was only to be known at the latter end: otherwise something of it would certainly have been mentioned before, either by a Prophet or by an Apostle: this seems to be additional proof that the long expected time (Daniel XII.89) must be at hand.[1]

Some of the many divine revelations Frick received were not to be made public yet: Several other real reasons of the Lord's judgements have likewise been given to the Writer, but as they are not absolutely necessary for our instruction and preparation, they are not permitted publicly to be mentioned at present. [2]

True Knowledge, as Frick informs us in a footnote to page 112, was published only after divine approval: "The merciful permission for publishing this book was received on the 14th day of March 1797, at noon, 12 o'clock; for which Mercy the Lord be praised for ever." Frick is very meticulous about the times he received his revelations, most of which appear to have been communicated to him in August 1795.[3]

Frick died in London on June 15, 1798, without being able to see the turn of the century that had so obsessed him. Perhaps it is just as well, as his prophecies didn't come to pass. He didn't leave a will. Although he lived separated from his wife at least from 1778 onwards, communication lines between the couple seem to have remained open: Josepha Frick is described as a widow in the Rastatt registers as early as June 26, 1798, eleven days after Frick had died in England. She died four years after her husband in Rastatt in 1802, in difficult circumstances.[4]

According to the oft-quoted Gerber[E.L. Historisch-biographisches Lexikon der Tonknstler, part 2, 1792 (DBA 112, 366) ???] Frick gave up the instrument in 1786 because of its ruinous effects on his nerves. But we have just seen Frick say:

> This restitution [of financial losses] came, however, so slowly,

[1] p.111, quoted in [van Heertum 22-3(1999), p. 133 ???
[2] p.111, quoted in [van Heertum 22-3(1999), p. 133 ???
[3] van Heertum 22-3(1999), p. 133
[4] van Heertum 22-2(1999), p. 73

> that at last he grew too old for pursuing his travels; and lately he employed much time upon this present [religious] knowledge, whereby he neglected all opportunities for increasing his [music] business. . .

In other words, it would appear that his religion was crowding out his music career. And earlier in the same passage he writes:

> These [musical] journeys [throughout Europe] were to be performed (as he but lately understood) merely [Frick's emphasis] for the purpose of proving now to all, who saw and knew him, that unlearned Men, like the Apostles, may again receive Light; and likewise that, as he found Mercy, every person might trust in the Lord for Pardon. . .

In other words, his music career was merely a prelude to his religious one. Furthermore, his long autobiographical passage (published in 1797, well after the supposed 'nerve damage') makes a point of enumerating the long list of misfortunes that befell him and led him to God—if "nerve damage that forced him to quit the armonica" had occurred, that would have been a particularly convincing calamity to share with the reader.

K.L. Roellig

Karl Leopold Roellig[1] (1750?–1804) was an armonica maker, performer and composer. He was born in Hamburg; we aren't sure exactly when—some time around 1750. We know nothing of his youth.[2] He was musical director of Ackermann's theatrical company in Hamburg from 1764 to 1769 and in 1771–2. His lost opera Clarisse was performed in Hamburg in 1771 and two years later in Hanover. Around 1780 he took up the glass armonica and went on a concert tour; in Dresden he was the guest of J.G.Naumann, and appearances are recorded in Hamburg (1781 and 1788) and Berlin (1787). From 1791 to his death he lived in Vienna, where he had a post at the court library and frequently

[1]NOTE: in German "ö" = "oe". In this book I consistently spell his name "Roellig", but in the literature in general you will therefore also see "Röllig" which is also correct.

[2]MGG 7:610

performed on the glass armonica. [Roellig & Kirchgaessner???] He was never married.

Roellig was very interested in improving the glass armonica. He visited most of the glassworks of Bohemia and Hungary in his search for the best glasses, and around 1785 developed a method for marking the chromatic glasses (the 'sharps and flats'—the 'black keys') with gold rims. In 1784 Roellig (like Frick 15 years earlier, but independently of other contemporary developments) attempted a keyboard version of the glass armonica.

Roellig also invented the Orphica (a portable piano) [???] around 1795 and developed the related Xänorphica in 1801 with Mathias Müller, and published numerous essays on instrument building. Naumann praised his 'subtle use of diminished and augmented intervals and harmonies and their resolution', but Rochlitz in the Allgemeine Musikalische Zeitung [???] reported that he 'plays far better than he writes'; his playing is said to have 'forced the audience to flee on account of the endless diminished 7ths and disconnected progressions'. Reichardt wrote two pieces for Roellig's glass armonica.[Groves, ???]

In 1787 Roellig wrote a rather extraordinary essay about the armonica: Über Die Harmonika: Ein Fragment ("Concerning the Armonica: A Fragment"). He begins by waxing quite eloquent about the instrument:

- "There has never been an instrument more important for the future than the armonica. . . "
- It is "the most beautiful and pleasant instrument ever possessed by mankind. . . " [1]
- "The impact of this instrument borders on the fabulous, and it is likely, if it ever should be lost, that the tale of this instrument will be for the future what the history of Orpheus is for readers today."[2]

He then shares five 'letters'—fantastic anecdotes, really—about the armonica, which he claims are true stories[??? Double check]. . .

[1] Roellig, 5
[2] Roellig, 5

Letter 1

Two men are about to have a duel (over a woman, of course). Friends persuade the antagonists to meet them in a meadow. Before the antagonists arrive, one of the friends hides in nearby bushes with his armonica. When the antagonists arrive, one friend tries to talk them out of their duel, while the other friend plays the armonica:

> He conjured them to follow this picture of tranquillity and peace—so I supported him with the full power of the armonica. Whenever he paused I would play and as soon as the sound of the armonica stopped he started begging them again. Suddenly they came running towards me —sobbing— and asked me to stop playing. I would only answer them through my beloved instrument until they were finally overwhelmed from feelings of friendship and embraced passionately.
>
> I was just about to put the armonica away—after it had been so successful—when we heard someone whispering the following words: "You went away, you lovely sound, with pleasure you absorb my night. You went away!" Just then a creature dressed all in white stepped out of the bushes. It was Mrs Von W.-R. had informed her about our plan and she wanted to be a witness of this adventure. We had hired a boat so we could travel part of our journey on water, and so she accompanied us. During various talks a big cloud enchained [???] the moon, a sight we watched with pleasure. You are aware of how easily Mrs von W's ideas change from the present to the future. The moon appeared again and we were guided by the long shadows of the objects surrounding us, which kept on changing their shapes, without knowing into the empire of ghosts.
>
> We talked about tone[???] and language of these supernatural creatures
>
> I was seated advantageously behind my instrument, had pulled the blanket back and thought that this would be the right time to play it. But as soon as I played the first few chords

> Mrs B. fainted, and only recovered just before we reached the dry land. I did not know that she was such a sensitive soul. But she shall never hear the armonica again without a warning in advance.

Letter 2

The author is invited to a friend's manor—which features "several temples, grottos, waterfalls, maze walks and subterranean arches"—to play at a ball that evening. Overcome by fatigue, the author slumbers, and is awakened by a servant. . .

> He suggested carrying my instrument and I was asked to follow him.
>
> He was in a rush but because I only followed him slowly I had the opportunity—as I was guided by curiosity—to follow the dull sounds of trombones, which seemed to be coming from the cellar.
>
> But imagine to my amazement when I walked (and nearly fell!) down the stairs leading to the cellar, and suddenly spotted a burial vault. I watched people putting a corpse into a coffin, and while sepulchral music was being played one was busy bandaging a vein on the arm of a person who was all dressed in white and covered in blood.
>
> Everyone else, apart from the health professionals, was covered in long black coats, and showed bare swords. At the entrance to the vault dead bodies were lying upon each other. The only light in the room came from candles that smelled similar to burning alcohol, and this light made the whole view look creepy and frightful.
>
> As I didn't want to lose my guide I hurried back. As soon as I arrived at the garden entrance the guide stepped inside. Impatiently he grabbed my hand and pulled me along. As soon as I entered the garden I stopped with amazement. I had never seen anything as beautiful as this. All seemed to be set alight by green flames—flames coming out of lamps—buzzing

of far away waterfalls—nightingales sang sweetly—there was smell of blooming flowers everywhere—it all seemed unearthly and nature seemed to have dissolved in magic. I was shown my seat behind an arbour with heavenly decorated interior.

Soon a person—who was unconscious—was carried into the arbour and I was given the sign to start playing. (I assumed it was the person I saw earlier in the vault, the one who got his veins bandaged. But I am not sure about this as all tradesmen wear noble robes.) I was too busy concentrating on myself that I did not really have a chance to notice what was going on.

But I did realise that the unconscious person—after I had played the armonica for one minute—recovered and asked full of astonishment: "Where am I? The voices I can hear. . . to whom do they belong?" Jubilation with trumpets and bass drums—that was the answer. Everyone suddenly grabbed their swords and rushed deeper into the garden, what happened then I cannot recall.

Letter 3

While traveling, the author arrives in a town where the residents. . .

. . . were famous for being very religious, and were also easily to impress. Even the name 'armonica' seemed impressive to them. When I offered to play for them the whole community gathered in church celebratory, as to where I followed them. The sacredness of this town and the extraordinary silence of such a big crowd of people—who were so soulful—made this whole event just beautiful.

The expression of impact the armonica showed was new to me. No fainting, no tears but she created merry, hopeful and smiling faces; the same hope that is created when you look across the borders of our life. We parted joyfully, after they had all passed me during the procession, looking at my instrument with silent admiration.

Some of the men accompanied us through the forest to the castle of Earl R., where we stayed the night. Some of them carried the armonica on their shoulders, and they treated it just like a sanctuary. The others guided the way by lighting up lanterns and candles in the street.

Letter 4

While I was on my journey to P.—I got the coachman to stop at a little bridge where I saw a little girl sleeping on the other side. I decided to wake her up with my armonica.

I hid not far from the girl and played a soft melody for her. The soft and quiet tunes seemed ineffective so I decided to play a few stronger chords. Just when I was about to finish playing she suddenly opened her eyes and looked at me. She was frightened, looked around her and started to cry.

After her first movement I stopped playing then continued again quietly; but she started to scream, jumped up and ran away as fast as she could.

When I managed to get out of the bush—my hiding place—she was long gone and I was left standing there surprised.

Even now when I think back on this event I still do not understand why she was so frightened of my music.

Letter 5

. . . However, I used to have a dog who could not tolerate any other tone but the one of my armonica. It seemed that as long as I was playing it he was always in a comfortable mood. He sometimes went over to the armonica and sniffed it by taking deep breaths.—

The expression of Mr. M.'s dog was however far more flamboyant and well worth observing. I would like to describe the

> following scene—which I was able to watch many times—as accurately as possible as it was so peculiar.
>
> This dog was remarkably big, humane and lethargic. But he knew exactly at what hour I would arrive at and tried everything to get into the room with me—be it through trick, flattery or violence. . . . When I began playing he was very alert; but after a few seconds only of me playing the armonica he would nod off and fall into a state of somnolence (= abnormal need to sleep), unable to resist.
>
> A few times he changed his sleeping position and while doing so he tried to cover his ears from the sound of the armonica; but as soon as he lay down he was overwhelmed by sleep again. All his movements suddenly became epileptic. The dog was just like a lifeless machine, only moved by weights and ropes, just like a puppet on a string. His eyes opened up violently and you could see the eyeballs rotating quickly. The mouth started to deform with intensity which lead to unnatural chewing, you could compare him to a ravenous wild dog. His paws moved swiftly as if he was running; and sometimes I noticed a silent bark.
>
> This scenario usually lasted for approximately half an hour. When he woke up he seemed as if he awoke from a dream, he was yawning, seemed droopy and fearful. . .

He concludes his article:

> It is advised not to touch the armonica if you are not in good spirits or not entirely healthy. It is no instrument to be used for just sheer amusement; it is worth much more. And if you are aware of how much it is worth then it will keep this value forever.
>
> You should play it only now and then—and when you do—only for a short time.
>
> If you consider that passion never lasts for a long time—but the armonica always tries to express the highest level of passion—you'll find that it manages to create passionate sensations in only a short space of time.

If you would like to try and resist the magic of the armonica you have to start early on, as it proves to be very difficult.

You should especially avoid playing her around midnight. I have never heard it singing with more passion than during the silent night, where everything seems quiet and still. The night went by in an instant and in the morning I felt as if I had not slept at all. . .

It gives great pleasure to everyone who plays it and everybody will be captive to its irresistible charms. It can become really dangerous if you do not try to moderately escape from this well-spring of innocent pleasure. . .

If you compare the impact the tone has on the audience (with much stronger impression on the player himself)—the unique sound of these tones—with the many repeats—everybody will have to admit that playing this instrument is not an easy task.

Not only these soft “airwaves” which fill your ears can have serious consequences but also the percussion and the constant straining of the cups with already fragile nerves on your fingers can cause illnesses which can—sometimes—even end fatally.

I can give evidence from my own experience—so I will now tell you a little about my history of illnesses which will hopefully be a warning to everyone. (An elaborated history of my illness—the beginning of it—its activity-peak-decrease—the way the diet influenced it and the constant use of a cold bath—it all would be far too much detail to tell you.) A persistent tremble of nerves, twitching of muscles, dizziness, cramps, swelling and palsy of the limbs were usually the results whenever I played my beloved instrument too much.

The most cruel side effect of all was however, that I started to imagine things, I dreamed with my eyes open, in the middle of the day I saw creatures (people) from different centuries, in the evening and at nights I saw ghosts which seemed to move with the wind, and which created strange noises and threatened me with my downfall.

Of course I only had myself to blame for feeling so miserable—as I kept on playing my instrument day and night. I was happy whenever I played my beloved armonica, I felt so much passion—how could I have anticipated that it would make me so sick?

During my travels I spoke to many different doctors but no one managed to come up with a reason for my bad health. I eventually realised that I needed a break and that I had to stop playing for a while when I was unable to lift my armonica as I was simply too weak.

Every time I recovered quickly, usually without the help of any medicine. But every time I had played for a while I fell ill again. I eventually decided—and it was a very hard decision—to quit playing the armonica all together.

This was six years ago—and I have not been ill since.—(I am not allowed to play any instrument which is similar to the piano or the violoncello as this usually leads to short breath and palpitations. And this snatches away all hope of ever being able to play the armonica again.)

I realised that my illness had been genuine, and that I had not imagined it when it failed to return after I had quit playing my armonica. It was even more convincing when I found out that the same thing had happened to Miss Davis [sic] and Organist Frick.

Miss Davis had to stop playing in Wetzlar, Frick in London. I do not want to blame Frick for keeping his illness a secret. I am assuming it might have been "revenge" on Germany as it seemed that many people did not care about him as an artist.

I don't want people to think the same of me—not only Germany but the whole world should realise that the armonica is a gift to them but can make you ill if you use it too often. I have warned many people not to play the armonica too much—artist and dilettante will read my warnings—but as soon as they play again they will forget about it.

> I wished however, that this fabulous instrument would be honored to highest perfection.

??? F. Reichardt

Friedrich Reichardt (1752–1814) German composer and 'Hofkapellmeiser' at the court of Kassel, traveled to England in 1785

Marianne Kirchgaessner

Marianne Kirchgaessner (1769–1808) was born in Bruchsal (in Germany, near its south-west border with France) to Joseph Anton Kirchgaessner and his wife Maria Theresia. The family was devoutly Catholic: Marianne—their fifth daughter—was baptized Maria Anna. Two years later another daughter arrived, Maria Gertrud Sophie, who would be her famous older sister's constant traveling companion in Marianne's last eight years.[Ullrich, 8-9] (They ultimately had 9 children, including at least one son, to whom Marianne would ultimately pay a last fatal visit.). Both parents were musical: her father was a good cellist and tenor singer, and her mother played piano and dulcimer. Little Marianne, just as musically talented as her brothers and sisters, was blinded by smallpox (which caused ulcerations on her corneas) at four years of age. (Mozart at 11 years old also contracted smallpox, and survived relatively unscathed.) Marianne's mother had died a short time before.[An article in Braunschweig Magazine, April 4, 1801, quoted in Schneider 332ff.] Her now doubly grieving father used all means and spared no expense to cure Marianne-without success. Marianne nevertheless persisted with her piano playing-without systematic instruction-to a point where Josef Reichsfreiherr von Beroldingen, a local official, heard her play, and was so impressed that he sent her to Joseph Schmittbauer (1718-1809), the Kappelmeister at Karlsruhe, for training, particularly on the glass armonica. Schmittbauer was not only an accomplished armonica player, but could build fine armonicas.[Ullrich, 9] Beroldingen not only referred Marianne to Schmittbauer, he also provided Marianne with an armonica, which cost at that time the extraordinarily high price of 100 speziesdukaten. (In 1742 Franz von der Trenck stood before the gates of Waldmnchen with his Hungarian army, and the city paid him a ransom of 50 speziesdukaten to spare the city.) Marianne studied armonica with Schmittbauer for 10 years with astonishing progress. By then her father (who had just retired with a very modest pension and was thus open to additional income), her sponsors including the Margrave of Karlsruhe, and most of all her teacher Schmittbauer-all felt she was ready for a concert tour that might earn all of them fame and fortune.

At this point Heinrich Bossler (1744–1812) music and newspaper publisher, together with his wife Sophie, took over Marianne's "management" and became her family-a business arrangement that blossomed into a lifelong friendship for the remaining 18 years of Marianne's life and career, including the agony of caring for her in her final illness and taking care of her funeral arrangements. Bossler continued to manage his publishing business while on the road with Marianne, and his main office in Spayer continued apparently unchanged.[Schneider, 180]. 1791: [For the outline of the following timeline I am indebted to Schneider, 317ff] Her almost ten-year concert tour begins in February, with a concerts in Heilbronn-expectations for this concert were so high that people journeyed for 4 or 5 hours to hear her[Letter of February 1791 quoted in Schneider, 321ff] -Ludwigsburg and Stuttgart (all close to her hometown), and then farther afield to Munich, Salzburg and Linz.

Here is a review of her Linz concert:

> The famous blind virtuosa Mademoiselle Kirchgaessner gave to Linz in the theater on 24 April a concert on the improved Franklin armonica; her heavenly playing on this extraordinary precious instrument delighted everyone with pure harmony to our ears, utterly exceeding all our expectations; because before this we heard only bare ponderous, melancholy Adagios [slow pieces] with individual howling tones [no chords?] on the armonica. But this young blind artist treats this instrument completely differently; she plays splendid compositions, on which she can be heard, full-handed with whole harmony, their subtle nuances, the tones wax and wane, her trills on the glasses are inimitable; Allegros [fast

> pieces], which before her yet no artist dared, she plays with an unbelievable talent, full of gentle grace and feeling. She could also be heard accompanied by several instruments, which must be played however extremely quietly. Excerpt of All European Newspapers. Vienna. Friday the 13. May. 1791. Nro. 109. [Quoted from Schneider, 324]

At a mere 21 years old she was a sensation, which paved the way to Vienna where she stayed for 5 nearly months. Mozart heard her and was inspired to compose music for her:

- The Adagio and Rondo (K617), a quintet for armonica, flute, oboe, viola, and cello, completed May 23, 1791. Marianne herself announced her premier performance of this 'entirely new' piece in the Wiener Zeitung ("Vienna Times") on August 13:

  > Filled with feelings of the warmest gratitude for the happy applause with which I was honored at the musical concert held by me on 10 June of this year at the I. & R. National Court Theatre, I deem it my duty to respond with all that lies in my power to the exhortation, so flattering to me, to allow myself to be heard on the armonica once more. I shall therefore, by most gracious I. & R. permission already obtained, hold another grand musical concert next week, before my departure hence to Berlin, at the I. & R. Krntnertor Theatre, and play on the armonica an entirely new and surpassingly beautiful concert quintet accompanied by wind instruments by Herr Kapellmeister[a Kapellmeister was a music director for nobility or for a large church. This position always involved supervision and direction of other musicians.] Mozart, as well as new variations on the favorite duet from the Molinaria, "Nel cor piu non mi sento", by Herr Kapellmeister Wanhal, and altogether such pleasing pieces as to persuade every connoisseur of music entirely that the armonica is the noblest of all musical instruments, exciting not sad and melancholy, but rather glad, gentle and elevated feelings. The forthcoming poster will give further details.
  >
  > Marianne Kirchgaessner[quoted in Deutsch, 399-400]

Mozart's quintet became one of the most popular pieces of her repertoire. [Ullrich, 44]

- The Adagio for solo armonica (K356 / K617a). [Kchel originally numbered this K356, but subsequent scholarship has shown that this was composed at about the same time as the quintet, hence the change in Köchel number to K617a. ???]
- A Fantasia in C (K616a), another quintet for armonica, flute, oboe, viola and cello. Alas, Mozart inconveniently died on December 5-having completed only the first thirteen fragmentary bars of this piece.

It is worth noting that Mozart had been acquainted with the armonica from his teenage youth: his first patron was Franz Mesmer, the inventor of 'mesmerism' (in which the armonica played a significant role. We'll be considering his story in more detail shortly). Mesmer owned a particularly large and fine armonica, was himself a capable player, and played his armonica for a 17-year-old Mozart. Wolfgang's father mentioned it in a letter to his wife:

> Herr von Mesmer, at whose house we lunched on Monday, played to us on Miss Davies's harmonica or glass instrument and played very well. It cost him about fifty ducats and it is very beautifully made.[Letter from Leopold Mozart to his wife, July 21, 1773; quoted from Anderson I:341-2]

A few weeks later Leopold brought up the armonica again, mentioning that Wolfgang himself tried playing Mesmer's instrument:

> Do you know that Herr von Mesmer plays Miss Davies's harmonica unusually well? He is the only person in Vienna who has learnt it and he possesses a much finer glass instrument than Miss Davies does. Wolfgang too has played upon it. How I should like to have one! [Letter from Leopold Mozart to his wife, August 12, 1773; quoted from Anderson I:343]

As we have seen earlier[???], Mozart was on friendly terms with Marianne Davies, and thus must have been acquainted with her playing:

> A few days ago Miss Davies arrived here and drove past our house in the mail coach. I recognized her and she saw us, for we happened to be standing on the balcony. A few hours

> later I went to call on her at the 'Three Kings', which is not very far off, as I guessed that she would be staying there, since it is the most respectable inn. She, her sister, her father and her mother could hardly express their joy. I told their servant where Herr Hasse was staying and very soon his daughter appeared, who also was beside herself with delight, for they have been most cordial friends since they met in Vienna. They all asked for you at once and they send you their greetings. You will surely remember Miss Davies with her armonica? [The Letters of Mozart and his Family, Anderson, 2nd ed. (1966) p.198 ???]

Nevertheless, it wasn't until almost two decades later that a now 35-year-old Mozart was inspired to compose for the armonica. His friend Davies didn't inspire him to get out his all-too-facile pen his patron Mesmer with the checkbook didn't inspire him either... But Kirchgaessner fired him up! It's difficult not to conclude that Kirchgaessner was simply a vastly superior player to Davies. Also, notice that Leopold says [in the letter of August 12, 1773] that Mesmer's armonica itself is 'a much finer glass instrument' than Miss Davies's. Thus it may also be the case that German—made armonicas were superior to English ones, which would have given Kirchgaessner a significant advantage. (Talent is helpful too, of course.)

Altogether Marianne played in Vienna three times that year: June 10 in the castle theater, on August 19 in the Krntnertor theater and on September 8 in the Jahn hall in the Himmelpfortgasse. For their concert in the Kärntnertor theater, which originally already should have taken place on 13 June, wrote Mozart "the Adagio and Rondo" in C-moll (K. 617).[Deutsch, 383]

1792: Concerts including Prague, Dresden, Leipzig, Berlin (including four command performances for the king, for which he gave her 100 Friedrichs of gold), Hamburg (which Marianne herself says included "an armonica quintet by the unforgettable Mozart, which he wrote for me just before his death in Vienna.") and Magdeburg. [Schneider, 325] (Marianne Davies dies in 1792.???)

1793: Concerts mostly close to home in Darmstadt and Bruchsal.

1794: On her way to London, she gives a private performance for

Christian Gottlob Neefe (1748-1798), Beethoven's teacher, which he said "uncommonly agitated me"[Schneider, 326]. Arrives in London in March. Salomon was producing a highly successful concert series for Haydn, and Marianne performed in the sixth and ninth of those concerts-also in March. Here's the program of the sixth concert (which also lists the performer's names), published in the Morning Chronicle, March 15, 1794:

> Part I:
> Ouverture, Piehl;
> Song, Mr. Florio;
> Concerto Violoncello, Mr. Damen, jun.
> Aria, Madame Mara;
> Terzetto, Madame Mara, Mr. Florio, and Mr. Fischer.
> Part II:
> Grand Overture (M.S.) Haydn;
> Aria, Mr. Fischer;
> Quintetto on the Harmonica, Mademoiselle Kirashgessner[!],
> (being her first appearance in this Ceuntry [!],
> Cavatina, Madame Mara.
> Finale[quoted in Schneider, 327]

Being a concert promoting Haydn's music, it's unclear if the quintet Marianne played was the one Mozart wrote for her, or if Haydn himself wrote another.

A review of the concert had this to say:

> The only novelty of the evening worth mentioning was the performance of Mademoiselle Kirch Gessner [!] on the Harmonica. Her taste is chastened, and the dulcet notes of the instrument would be delightful indeed, were they more powerful and articulate; but that we believe the most perfect execution cannot make them. In a smaller room, and an audience less numerous, the effect must be enchanting. Though the accompaniments were kept very much under, they were still occasionally too loud.[Morning Chronicle, March 18, 1794, quoted in Schneider, 327]

Notice that the main complaint is that they could barely hear her. Another review said: Mademoiselle Kirashgessner [!] performed upon an instrument little known-the Harmonica. It is a conic barrel of glass, which she touches with a truth and feeling so soft, so persuasive, that—'Melancholy marks it for her own.'[Oracle, March 19, 1794, quoted in Schneider 328] (Considering that England had just lost the American Revolution, it is understandable that neither review mentioned that Benjamin Franklin invented Marianne's instrument!)

She performed again at Salomon's ninth concert on April 7:

> Part I
> New Overture (M.S.) Reichards [J.F.Reichardt],
> Aria, Mr. Fischer;
> Concertante for Clarinet and Bassoon, Messr. Hartman and Parkinson.
> Scena, Madame Mara.
> Sonata on the harmonica, M. Kirchgaessner
> Part II.
> The New Grand Overture, (M.S.) Haydn,
> which was performed last Monday.
> Cavatina, Mr. Fischer;
> Concerto, Violin, Signor Viotti.
> Rondo, Madame Mara.
> Finale
> (Morning Chronicle, April 5, 1794, quoted from Schneider, 328)

At least by this concert they spelled her name correctly! The sonata she played was presumably composed by Haydn-alas it has not survived. Being blind, new music was played for her on the piano, which she then 'played by ear' from memory! Unfortunately this may have resulted in fewer copies being made. A Braille-like system for notating music had been invented for the blind pianist Paradis—a contemporary of Kirchgaessner—but she never adopted it. (We shall meet Paradis in connection with Franz Mesmer a little later on.)[1]

In 1794 Fröschle (a native-born German) made her a new instrument, which she used from then onwards. This instrument (and Marianne) were reviewed in October 1795:

[1]Ullrich, 17

> The famous virtuosa on that heavenly instrument, the armonica, Miss Kirchgaessner, will leave England at the earliest opportunity, and, with a reputation which follows her, to pursue her destiny through Hamburg. She has, according to information from Mr. Rath[apparently 'Rath' is the English equivalent of 'Heinrich'] Bossler, a completely new armonica by Mr. Frschle (one of the first mechanics of London, which if I may say so, is in truth first in his craft) leaving behind all well-known instruments by far, and with good reason it deserves to be called the most perfect musical instrument. Mr. Rath B. looked for the most simple, flexible resonator he could attach, whereby the armonica, especially in the bass, has an uncommon strength so that now the soul-elevating effect of the deep tones affects each listener unbelievably with true charm. With this improvement the instrument, which has a reputation of being gentle, noble in tone-and the delicacy of the inimitable performance of Miss Kirchgaessner still makes abundantly clear its excellent tone—is all the more full and free. Also, in building this splendid instrument, which is worked and inlaid in the most tasteful mahogany, Mr. Frschle has given us a true masterpiece, which truly makes many an honor for him. We congratulate all connoisseurs of music, who have the opportunity to hear this precious and unique instrument under the inspiring fingers of Miss Kirchgaessner. [1]

While she was in London Dr. Fiedler prescribed eye-drops which improved her vision to the point where she could vaguely distinguish shapes and colors.[2]

1795: Two two-hour concerts a day (!!) under the patronage of the duchess of York. Here is the announcement in the (London) Times (May 8, 1795):

> Under the Patronage of Her Royal Highness The Duchess of York. Miss Kirchgaessner's Performance on the Grand Harmonica, No. 57, Polandstreet, Soho, every day from 1 till

[1] Supplement No. 170 of the Hamburg Impartial Correspondent for October 24, 1795.[trans. By the author, source in Schneider, 330

[2] Pohl, Mozart Und Haydn, II, 264, and Schneider, 334

> 3, and from 7 till 9 o'clock. Admittance 5s. Each person.- Miss Kirchgaessner respectfully begs leave to acquaint the Nobility, Gentry, and her friends, that she means to discontinue her performance on the above instrument after the 14th inst[!]. She entertains the most flattering hopes that those amateurs, who are sensible of the superiority which this instrument so decidedly maintains above all others, it being so happily calculated to convey to the heart the most heavenly sensations, will within this short period manifest the encouragement which they very kindly conceive the abilities of Miss K. deserve, and that patronage of which she has had the honour of receiving already the most agreeable marks.[1]

These earned Kirchgaessner a small fortune. (At this time solo concerts were not yet common).[2]

1796: In November Marianne leaves London for Hamburg, where she gives concerts in November and December.

1797: Goes to Copenhagen, where she gives a concert in May for the Danish king. Performs in Knigsberg, and begins her journey to St. Petersburg. (A daunting journey given road and travel conditions in those days.)

1798: Stays in Petersburg to mid-year. Concerts in Knigsberg in November.

1799: Concerts in Thorn, Posen, followed by presentations in Schleits, Lausitz and Saxonia

1800: By this point a long list of the eminent composers of her day had composed for her: Clementi, Fasch, Haydn, Hoffmeister, Mozart, Naumann, Salieri, Reichardt and Vanhall-and she knew them all personally! Bossler buys for them a country home in Gohlis (a suburb just north of Leipzig) for herself and the Bosslers, (3700 thalers cash, 2000 thalers in a mortgage) which included meadows, two horses, six dairy cows, sheep, seeds and agricultural equipment.[Schneider, 214] Her almost decade-long concert tour is over-only concerts in relatively close

[1] Quoted in Schneider, 329
[2] Ullrich, 12

cities from now on, and only in fall and winter-spring and summer were spent at Gohlis.[AMZ January 18, 1809???]

1801: Concerts in Hanover and Frankfurt. In this year H. Jung writes: . . . This modest and virtuous person is easily the greatest master of the heavenly instrument of the English glass armonica. . . [quoted in Schneider 335]

1802: Concerts in Stuttgart.

1803: Predominantly at home in Gohlis

1804: Concert in Leipzig

1805: Concerts in Berlin and Breslau

1806: Vienna. Concerts in the Redoutensaale to a full house, as well as other performances, all made precarious by the French occupation of Vienna. The war thwarted her plans to tour Italy.[Ullrich, 14] In October, at her home in Goelis she had the misfortune to be mistreated by Napolean's soldiers, fresh from their victories at Jena, which "weakened her constitution and from which she never fully recovered."[AMZ January 18, 1809 ???]

1807: Predominantly at home in Gohlis

1808: Concert in Prague. Goethe visits Kirchgaessner, as noted in his diary entries for June 29: "At 4 o'clock with Ziegesars to Miss Kirchgaessner, who played some on the armonica", and for July 28, noting of their visit simply "Kirchgaessner".[Goethe's diary entries, quoted in Schneider, 339. Unfortunately no one seems to be able to supply a source reference for the quote ascribed to Goethe that the armonica was the "Herzblut der Welt" ("the heart-blood of the world"). See Ullrich, 18]

She gives concerts in Stuttgart in November at the Knig von England hotel. "The hall, the gallery and the adjoining rooms hardly contained the quantity of listeners." [1]. The program included singers and orchestra:

First Part

[1] Morgenblatt für gebildete Stände, Nr. 281 of November 23, 1808. Quoted in Schneider, 340, trans. by the author

Overture by Cherubini
Ballade by Zumsteeg for armonica and voice
Large solo for armonica, accompanied by orchestra by A. Reicha
Air by Danzi, sung by Miss Long

Second Part
Symphony by Haydn
Air by Salieri, sung by Mrs. Graf
Solo Sonata for Armonica
"Johanna's Farewell", a melodramatic monolog from the romantic tragedy The Virgin of Orleans, by Mr. Von Schiller; narration by Mrs. Gehlhaar, with armonica and orchestra. Music by A. Reicha.[Schneider, 341-244].

The performance—which turned out to be nearly her last—received the following poetic description on November 23, 1808:

What wonderful ringing,
Festive, with lofty singing!
What full harmony!
I float, losing my earthly
Shell, already to the nether
regions where the Good abide forever?
How have I earned, o pious one,
Your heavenly welcome?
Ha, a strange sunshine radiates from me!
Never have I felt such godly
Bliss flow over me. I hear
Eden's clarity, a joyous choir,
Sounds of Hallelujah ring.
The Sons of Light give me well-being!
Brothers, lead me to the Nameless
One So I can cry Thankfulness,
Pray praises, sing praises!
Ah, the sounds harmonious—
They sound—what sweet reverie!
Yet still here below must I tarry;
After all it is heaven's, and mine the feeling.
Thanks be to your magic playing,

Muse of the armonica!
A younger [St.] Cecilia!
O you sounds of the spirit are gradually
over everywhere, which is holy,
And a human a cherub is.
Even would an atheist
Call faith from the depths of his heart:
God! Immortality! Thou Art! [1]

Now 39 years old, she had just performed in Stuttgart and was determined to see her brother in nearby Odenheim, with whom she had

---

1

Welche wundervolle Klänge,
Festlicher, als Hochgesänge!
Welche Harmonien—Fülle!
Schweb ich, los der Erdenhlle,
Schon empor zu Regionen.
Wo die Guten ewig wohnen?
Wie verdien' ich, o ihr Frommen,
Euer himmlisches Willkommen?
Ha, mir strahlen fremde Sonnen!
Nie empundne Götterwonnen
Überströmen mich.—Ich höre
Edensharfen, Jubelchöre,
Halleluja rings ertönen.
Heil mir bey des Licthes Söhnen!
Brder, führt ich zu dem Einen
Namenlosen, Dank zu weinen,
Lob zu beten, Lob zu singen!—
Ach!—die Harmonie'n verklingen—
Sie verklangen-Süßes Träumen!
Noch muß ich hienieden säumen;
Doch ist's Himmel, was ich fühle,
Dank sey deinem Zauberspiele,
Muse der Harmonika!
Jüngere Cecilia!
O du tönst den Geist allmlig
Ganz hinüber, daß er selig,
Und der Mensch ein Cherub ist.
Selbst ein Gottesläugner riefe
Glübig aus des Herzens Tiefe:
Gott! Unsterblichkeit! Du bist!

Morgenblatt für gebildete Stände, Nr. 281 of November 23, 1808. Quoted in Schneider, 345, trans. by the author not had contact for seven years. The roads between Stuttgart and Odenheim were less than optimal, particularly in winter. Her manager Bossler wrote: I had traveled the most of Europe with our dear Marianne, and we came across many dangerous and bad passes and roads in the past; we never overthrew the vehicle and nothing has ever happened to her, but every time we mentioned narrow passes she feared. And I always felt sorry for her whenever we had to pass these narrow roads. Although she was barely able to see her surroundings, as she had sadly lost her eyesight, she always imagined the worst scenario; and although we used to try to convince her that the danger was over, it did not help. So imagine how feared she was on this journey![1]

Poor roads in winter proved an insufficient impediment: the reunion was accomplished, and as Bossler says:

> "Thursday, 24th November the loving sister and brother said good-bye-only too soon find themselves again in a better life!"[???]

On the return trip there were problems with her coach; she was exposed to too much cold, and contracted pneumonia (or something like it. Medical diagnosis in those days was still very primitive.) Her condition waxed and waned for about a week:

> Her sister and I believed that she might be suffering from a cold again; she was given painkillers. But all through the night she was agitated and her temperature rose more and more, so on Monday morning we sent for the doctor.
>
> Dr. Stockar came to see her, and he also believed that she was suffering from a cold. I was slightly relieved by the diagnosis, however myself and her sister were worried about our friend being so half hearted about the whole situation.
>
> In the afternoon the doctor came back and gave us all hope; but the fever continued and she had a very disturbed night from Monday to Tuesday.
>
> She felt slightly better on the Tuesday although towards the evening she complained about pains in her abdomen. Surprisingly the temperature rose so much that she started to rave. I sent for the doctor during the night and begged him

[1] AMZ, Bossler, ???

> to tell me the truth about her condition. He explained that he was really worried about her illness.
>
> We tried everything possible to rescue our dear ill patient: with permission of Dr. Stockar we also consulted Dr. Wepfer. Both doctors had a long talk and tried everything possible to keep her alive.
>
> Both doctors stayed aside our ill patient all day long; however the illness deteriorated and was still going strong by Wednesday and Thursday night, and she raved even more.

Alas, her manager and friend Bossler finally wrote:

> On Friday, 9th of December at approximately 10am we noticed that death was near. All my hopes faded away and so did my consciousness. I was destroyed at the thought to lose her, I loved her like a father, after all she was my travel companion for the past eighteen years, and we shared many happy and also sad moments.
>
> She was heartbroken whenever she failed to please people. Her fingers—which once created such heavenly music and lifted so many thousands of people into higher regions—turned stiff—all has been robbed by death![1]

And later Bossler records:

> At around four pm the same day Padre Laeuble, confessor at the convent Paradies (which is situated approximately half an hour from Schaffenhausen in Thurgau) came to see us to pray once again with my dying friend. And before she passed away she said a few times clearly: Beautiful! Very beautiful! And she also said Brother *) and Therese **) in a weak voice.
>
> *) Our dying Kirchgaessner could not know what we found out in Karlsruhe, eight days later, on the 27th of December, on our journey back from Switzerland: her brother, whom she loved so much, had passed away on the 6th of December, three days before her own death. He died from the same illness as our dear friend! It seemed as if-those who have

[1] AMZ, Bossler, ???

> loved each other so much and had never been apart-paid for their trust in each other by dying together!
>
> **) Therese was the name of her older sister who died in Mannheim in 1804.

In the same necrology, Bossler records Professor Appenzeller who wrote to Professor Mueller the day after Kirchgaessner's death:

> I can still feel a shiver down my spine when I think back on the news you gave me regarding our dear Kirchgaessner! Perhaps she is with the Lord by now-the only fatherland full of harmony. Her soul will be celebrating; her glance will now greet the light which has always shone in her world. Untroubled harmony now rings in her breast—the spirit of her dreams has now disappeared and she will now have resolved the 'mystery of existence'.[???]

Bossler wrote the newspaper announcement of her death (December 29, 1808):

> With indescribable sadness must I announce to you the death of my dear Kirchgaessner, in Schaffhausen on December 9. In the evening at about 9:30 she passed over to eternity. She is in the earth there, she whose soulful playing charmed so many thousands. Her earthly remains lay in Paradies, a convent, whence the worthy nobles of Schaffhauser in mourning dresses, and myself, in more than 20 coaches, accompanied her to her grave. In all of Schaffhausen neither wagon nor horse were to be had, and many of the first families accompanied us in the terribly cold weather on foot to her final resting place. Miss Stockar and fourteen of the noblest daughters of this city, together with the whole music college with their president in the lead, drove in 7 cars to the convent, in order to give to this artist, as in life, so also in death to give her their respects, and in the convent church, to give a Castrum Doloris [a traditional decoration of flowers and candles signifying importance] and perform a Requiem. Then Miss Stockar sang a scene from the oratorio Lazarus by Hasse with great dignity, and after a eulogy and all remaining ceremony (and at every altar a Soul's Mass was read),

> the body returned to the city. The crowding was so great that the hotels had to call the police to keep peace and order. This was the day after her death-thus Saturday December 10. In Schaffhausen Professor Mller further honored the good Kirchgaessner by placing an extremely precious laurel ring in her coffin, and all, even the first women of the city, came to her viewing. In such a way died my dear good Kirchgaessner, whom for 18 years I saw her art germinate, bloom, and prosper to the highest maturity, and the deadly wounds strike deep into my heart. I will go in a few days from here (Mannheim) to Leipzig, and write a complete biography of the blessed one, in which will be included a fine portrait, and a copper engraving of the Paradies convent. Bossler [Morgenblatt fr gebildete Stnde for December 9, 1808, quoted in Schneider 353, trans. by the author]

An obituary in the Allgemeine Musicalishce Zeitung (The General Musical Times) had this to add about Marianne:

> As is well known she suffered since childhood from very weak eyesight, and since then, in various years, she was nearly completely blind. Her character was gentle resignation and acceptance of her fate, and only in occasional moments and on special inducements was it disturbed by sickly irritability. [S]he was free from all artist moods, obliging everyone whom she could please with her talents.[AMZ January 18, 1809, trans. by the author]

Bossler wrote a necrology of Kirchgaessner (which we quoted above) but never completed the promised biography. He suffered from ill health until his own death in 1812, sponsors withdrew from the project, and there were fewer than expected subscribers.[1]

Bossler and his wife lived in the country home in Gohlis until 1810 when they sold it (for 6500 thalers-they had paid 5700) and lived off of its proceeds.[Schneider 220]. Upon Bossler's death in 1812, business and inheritance issues with their children left his wife Sophie in modest conditions, and she died in 1823.[2]

[1] Bossler's last letter to Professor Mller, January 18, 1810, quoted in Schneider, 365ff
[2] Schneider 221

Considering the degree of Kirchgaessner's fame in her day, it is surprising that no drawing or portrait of her has survived, nor as far as we know was one ever made![Ullrich, 16] She also never had students, or composed music herself.[1]

She had two armonicas: the one Schmittbauer made for her, and the one that Frschle made for her in London-which she was presumably using at the time of her death. The fate of both instruments is completely unknown.

??? Angelica Kaufman

Angelica Kaufman (1741–1807) wasn't an armonica virtuoso—she was a famous painter of her day who apparently played the armonica (exceptionally well) for personal amusement. As a youth she excelled at both music and painting, and in ??? made the decision to make painting her profession. . . . [???]

Angelica is pictured here in a copper plate by Karl Rahl and appeared 1819 as an illustration in the Viennese reproduction of the first collection of "Schriften" ("Writings") of Helferich Peter Sturz (1736–1779), which had been originally published 1779 in Leipzig. Angelica seems to be playing her armonica to gain inspiration-her easel stands at the ready for her next painting. Of her playing Sturz wrote:

> "London, den 15. Sept. 1768. When [Angelica Kaufmann], with her armonica, sings Pergolesi's Stabat,[???] " [2]

It is likely that Kauffmann, Italian in all but birth, who eventually blossomed as an exquisite performer on the armonica[King, 111 ???] came to know the instrument at the time of her sojourn in Naples through the performances of Marianne Davies.[Pace 279–280]

Angelica's is one of only two images of people playing armonicas by artists of that era (the other being the image of an anonymous armonica

[1] Ullrich, 17

[2] "Wenn sie [Angelica Kaufmann], vor ihrer Harmonika, Pergolesis Stabat singt, ihre gro"sen schmachtenden Augen, pietosi a riguardar, a mover parchi, gottesdienstlich aufschlägt, und dann mit hinströmendem Blicke dem Ausdruck des Gesanges folgt, so wird sie ein begeisterndes Urbild der heiligen C"agtcilia . . . ". Quoted in Deutsch, 382

player seen below[???]).

Claude Desrais, “Armonica Player” repro from Freia Hoffmann, Instrument und Körper, 59 (see “Women and the glass armonica”, Hadlock, p.512)

Part VII

Composers And The Armonica

This list is far from exhaustive—mostly suggestive, and only includes composers not already covered in the 'Virtuosi' section. Composers who played a significant role (or who have interesting stories) get greater treatment. . .

J.A. Schmittbauer

Joseph Aloys Schmittabur (1718–1809) was a German composer, conductor, and armonica maker. Born in Bamberg, he received his musical education from the organ builder J.P. Seuffert in Wrzburg and was a musician at the Rastatt court from about 1745 until its dissolution 1771. There he was Konzertmeister in 1762 (leading the orchestra from the harpsichord) and Kapellmeister from 1765. In 1772 he became Konzertmeister at the Karlsruhe court, but in 1775 he went to Cologne as Kapellmeister at the cathedral and director of public concerts. In 1777 he accepted an invitation to return to Karlsruhe as Kapellmeister, and was also active there as a teacher of glass armonicas, whose range he extended to four octaves (c to c""). From about 1781 to 1791 he instructed Marianne Kirchgaessner. At his retirement in 1804 (he was honored with the title Oberkapellmeister in 1806) his son, Abbé Ludwig Joseph Schmittbaur (1755–1829), a lieder composer, took his place at court. His two other sons, August (b. 1763), a clarinetist and flautist, and Nepomuk, a violinist, also belonged to the Karlsruhe Hofkapelle, and his daughter Therese was known as a singer and keyboard player in the 1770s.[Niemöller]

J.A. Hasse

[??? Looks like it's in the public domain. From the wikipedia article on Hasse]

Johann Adolph Hasse (1699–1783) was a German composer. We have already met him as the composer of the work L'Armonica for Marianne Davies.

Hasse was born at Bergedorf near Hamburg and received his first musical education from his father. Having a fine tenor voice, he chose a theatrical career and joined the operatic troupe conducted by Reinhard Keiser, in whose orchestra Handel had played the second violin some years before. Hasse's success led to an engagement at the court theatre of Brunswick-Lneburg, and it was there that, in 1723, he made his debut as a composer with the opera Antigonus. The success of this first work induced the duke to send Hasse to Italy for the completion of his studies, and in 1724 he went to Naples and placed himself under Porpora, with whom, however, he seems to have disagreed both as a man and as an artist. On the other hand he gained the friendship of Alessandro Scarlatti, to whom he owed his first commission for a serenade for two voices, sung at a family celebration of a wealthy merchant by two of the greatest singers of Italy, Farinelli and Signora Tesi.

This event established Hasse's fame; he soon became very popular, and his opera Sesostrato, written for the Royal Opera at Naples in 1726, made his name known all over Italy. At Venice, where he went in 1727, he became acquainted with the celebrated singer Faustina Bordogni (born at Venice in 1700), who became Hasse's wife in 1730. The two artists soon afterwards went to Dresden, in compliance with a generous offer made to them by the splendor-loving elector of Saxony, Augustus II. There Hasse remained for two years, after which he again journeyed to Italy, and also in 1733 to London, in which latter city he was tempted by the aristocratic clique inimical to Handel to become the rival and antagonist of that great master. But this he modestly and wisely declined, remaining in London only long enough to superintend the rehearsals for his opera Artaserse (first produced at Venice, 1730).

All this while Faustina had remained at Dresden, the declared favorite of the public and unfortunately also of the Elector; nor was her husband, who remained attached to her, allowed to see her except at long intervals. In 1739, after the death of Augustus II, Hasse settled permanently at Dresden till 1763, when he and his wife retired from court service with considerable pensions. But Hasse was still too young to rest on his laurels. He went with his family to Vienna, and added several operas to the great number of his works already in existence. It was in 1769, in Vienna, that he wrote the cantata *L'Armonica* for Marianne Davies on the armonica and her sister Cecilia the singer. His last work for the stage was the opera Ruggiero (1771), written for the wedding of Archduke Ferdinand of Austria-Este at Milan.

On the same occasion a work by Mozart, then fourteen years old, was performed, and Hasse observed “this youngster will surpass us all.” By desire of his wife. Hasse settled at her birthplace of Venice, and there he died.

[??? Music extract in Hadlock, Women and the Glass Armonica, p.514ff.]

J.G. Naumann

Painting painted of 1780, by his brother Friedrich Gotthard Naumann [??? Need permission] Johann Gottlieb Naumann (1741–1801) was a conductor, music director, and composer who wrote for the armonica.

He received his earliest musical instruction at the Kreuzschule, where he was taught by the organist and Kreuzkantor Gottfried August Homilus, himself a pupil of J.S. Bach. He was invited by the Swedish violinist Wesstrm to tour Italy as his accompanist in 1757, but the trip proved far longer than planned. In fact, it lasted some seven years, during which Naumann studied with Tartini in Padua, Padre Martini in Bologna and Hasse in Venice. He made his debut as an operatic composer in Venice in 1762 when the Teatro San Samuele staged his *Il tesoro insidiato*.

Two years later, Naumann’s *Li creduti spiriti*, composed for the Venetian carnival in collaboration with two other composers, secured the endorsement of Hasse and Ferrandini, both of whom recommended him for a post as second church composer in Dresden. There, Naumann was soon promoted to chamber composer in 1765. Subsequently, he decided to return to Italy (1765-8), where he composed his opera La clemenza di Tito, staged in Dresden in 1769. Naumann’s next stay in Italy (1772-1774) further consolidated his reputation as a major operatic composer. (Naumann’s *Le nozze disturbate* was produced by Haydn in Esterhza in 1780). Subsequently, he was finally appointed Kapellmeister at Dresden in 1776.

In 1777, the Swedish ambassador Count Lowenhjelm asked him to travel to Stockholm, where he assisted King Gustavus III in reforming the Hovkapell. He also composed operas for the Swedish court, many of which were tremendously successful. The finest, *Cora och Alonzo*, was staged for the inauguration of the Royal Opera House. In 1782, Gustavus III commissioned a Swedish nationalist opera, Gustaf Wasa, which received its premiere in 1786 and remained Sweden's most popular opera for over a century, with more than 250 performances.

In 1785, Naumann was guest opera composer and conductor for the Danish court and reorganized the opera at Copenhagen. He would not commit to an extended contract there, however, and returned to Dresden, becoming Oberkapellmeister. In 1792, he married Catarina von Grodtschilling, daughter of a Danish vice-admiral, and although during his final years he contemplated a German national opera based on his experiences in Scandinavia, it never materialized.

After a performance stay in Berlin in 1788/89 he returned to Dresden, where he died in 1801. Naumann wrote several works, including a set of 12 sonatas, for the glass armonica. [??? Groves says he suffered nervous disorders]

W.A. Mozart

Wolfgang Amadeus Mozart (1756–91) was a prolific and highly influential composer of Classical music. His enormous output of more than six hundred compositions includes works that are widely acknowledged as pinnacles of symphonic, chamber, piano, operatic, and choral music. Mozart is among the most enduringly popular of European composers, and many of his works are part of the standard concert repertoire. And most important of all, he also composed for the glass armonica! Mozart was born in Salzburg, now in Austria but then in the Holy Roman Empire. His only sibling who survived beyond infancy was an older sister: Maria Anna, nicknamed Nannerl. Mozart's father Leopold (1719–1787) was one of Europe's leading musical teachers and a noted composer in his own right. Leopold gave up composing when his son's outstanding musical talents became evident. They first came to light when Wolfgang was about three years old, and Leopold, proud of Wolfgang's achievements, gave him intensive musical training, including instruction in piano, violin, and organ. Leopold was Wolfgang's only teacher in his earliest years.

During his formative years, Mozart made several European journeys, beginning with an exhibition in 1762 at the Court of the Elector of Bavaria in Munich, as well as the Imperial Court in Vienna and Prague. A long concert tour spanning three and a half years followed, taking him with his father to the courts of Munich, Mannheim, Paris, London, The Hague, again to Paris, and back home via Zurich, and Munich. During this trip Mozart met a great number of musicians and acquainted himself with the works of other great composers. A particularly important influence was Johann Christian Bach, who befriended Mozart in London in 1764–65. (You'll recall that J.C. Bach was also very helpful to the Davies sisters.) They again went to Vienna in late 1767 and remained there until December 1768. On this trip Mozart contracted smallpox, and his healing was considered by Leopold as a proof of God's intentions concerning the child. (As we have seen, Kirchgaessner was blinded by smallpox.)

After one year in Salzburg, three trips to Italy followed: from December 1769 to March 1771, from August to December 1771, and from October 1772 to March 1773. During the first of these trips, the Mozarts were actually standing on the balcony of their lodgings when they saw the Davies family arriving in Milan. Leopold writing to his wife on 21 September [1771] said: A few days ago Miss Davies arrived here and drove past our house in the mail coach. I recognized her and she saw us, for we happened to be standing on the balcony. A few hours later I went to call on her at the 'Three Kings', which is not very far off, as I guessed that she would be staying there, since it is the most respectable inn. She, her sister, her father and her mother could hardly express their joy. I told their servant where Herr Hasse was staying and very soon his daughter appeared, who also was beside herself with delight, for they have been most cordial friends since they met in Vienna. They all asked for you at once and they send you their greetings. You will surely remember Miss Davies with her armonica?[1]

When Leopold says "I recognized her and she saw us" and "You will surely remember Miss Davies with her armonica" it is clear that by 1771 (the date of his letter) the Mozarts (including Wolfgang's mother)

[1]The Letters of Mozart and his Family, Anderson, 2nd ed. (1966) p.198

must have been already acquainted with the Davies sisters and Marianne's armonica. When did that occur? Comparing their timelines may give us a clue [???]:

Year	The Davies	The Mozarts
1751	London	Salzburg
1762		
Winter	1763/4	Ireland
Summer	1764	London
1762–5		Munich, Paris, London, The Hague, Zurich
1764(?)	Paris Salzburg	
1767	London	Vienna
1768	Europe	Vienna
1769	Vienna	

We know that both Mozart and the Davies were giving concerts in London in 1765. This gives us some idea of what those concerts may have been like:

> "Formal concerts during the daytime required the special permission of the Lord Chamberlain. Most daytime concerts were therefore quite different in nature, being marketed as exhibitions. In much the same way as curiosities such as 'the Learned Pig' or a mechanical chess-player, the young Mozart was in 1765 put on display, carrying out keyboard tricks, playing the harpsichord with a handkerchief over his hands, and so on. The performances took place initially at the Mozart's Soho lodgings, later at the decidedly down-market Swan and Hoop Tavern in Cornhill. Mozart was in fact contributing to a spate of daytime concerts in the early 1760s, coinciding with a fashion for the musical glasses; thus in 1761 one Drybutter could be heart at his house every day from noon until two o'clock, playing ten tunes to each set of company for 1/-. The glasses were one of the instruments of Ann Ford, who (contrary to some reports) reappeared at the Spring Garden Room giving half-a-crown daytime appearances from 15 October 1761 onwards. An additional incentive on one occasion in 1762 was the presence of three Cherokee chiefs, who were hawked round numerous venues this summer. [McVeigh, 38–39]

Marianne Davies was giving performances in London at the time. So they may have met around 1765 in London, or perhaps around 1769 in Vienna.

In 1773 father and his 17-year-old son were in Vienna and encountered the armonica again at Franz Mesmer's house. Leopold wrote home to his wife:

> Herr von Mesmer, at whose house we lunched on Monday, played to us on Miss Davies's harmonica or glass instrument and played very well. It cost him about fifty ducats and it is very beautifully made.[Letter from Leopold Mozart to his wife, July 21, 1773; quoted from Anderson I:341–2]

A few weeks later Leopold brought up the armonica again, mentioning to his wife that Wolfgang himself tried playing Mesmer's instrument:

> Do you know that Herr von Mesmer plays Miss Davies's harmonica unusually well? He is the only person in Vienna who has learnt it and he possesses a much finer glass instrument than Miss Davies does. Wolfgang too has played upon it. How I should like to have one! [Letter from Leopold Mozart to his wife, August 12, 1773; quoted from Anderson I:343]

In a letter of May 28, 1778, however, writing about the playing of Besozzi, a famous oboist, Leopold's opinion of the armonica seems to have changed:

> This mezza di voce was too frequent for my taste and has the same melancholy effect on me as the tones of the armonica, for it produces almost the same kind of sound.[???]

In 1777, accompanied by his mother, Mozart began a tour of Europe that included Munich, Mannheim, and Paris. In Mannheim he became acquainted with members of the Mannheim orchestra, the best in Europe at the time. He fell in love with Aloysia Weber, who later broke up the relationship with him. He was to marry her sister Constanze some four years later in Vienna (over his father's vehement objections). During his unsuccessful visit to Paris, his mother died (1778).

In 1780, *Idomeneo*, widely regarded as Mozart's first great opera, premiered in Munich. The following year, he visited Vienna in the company of his employer, the harsh Prince-Archbishop Colloredo. When they returned to Salzburg, Mozart, who was then Konzertmeister, became increasingly rebellious, not wanting to follow the whims of the archbishop relating to musical matters, and expressing these views he soon fell out of favor with him, and was ultimately fired. Subsequently Mozart chose to settle and develop his own freelance career in Vienna after its aristocracy began to take an interest in him. Mozart made Vienna the "base of his operations" for the rest of his life.

As we have seen, Mozart heard Marianne Kirchgaessner in 1791[see the section on Marianne Kirchgaessner] and was finally inspired to compose for the armonica—with which he had been acquainted since at least his teens. He composed the Adagio in C (K617a/K356) for solo armonica; the Adagio and Rondo (K617)—a quintet for armonica, flute, oboe, viola and cello; and started a third quintet—a Fantasia in C (K616a), of which he only completed the first 13 bars—all in the spring of 1791. Kirchgaessner performed the quintet at least (K617) and presumably also the solo Adagio in [???]. In the summer Mozart wrote his famous opera Die Zauberflöte ("The Magic Flute"), in the fall his Requiem, and died that December.

L. van Beethoven

Ludwig van Beethoven (1770-1826) a composer certainly as famous as Mozart. He was born in Bonn. In 1787, at age 17, he visited Vienna-and met Mozart. In 1792, at age 22, he visited Vienna again in 1792—a year after Kirchgaessner's performances of Mozart's new works for the armonica and Mozart's death, and a year after Roellig moved to Vienna. In 1794 he moved to Vienna and made it his 'base of operations' for the rest of his life—as Mozart had before him.

Unlike Mozart, there is no evidence that Beethoven was interested at all in the glass armonica. Its delicate sound, after all, hardly fits with Beethoven's musical aesthetic. In 1806, when Kirchgaessner performed in Vienna again, Beethoven would have been in the city. Yet a search of his extant letters from 1790 to his death in 1826 yields no mention of either the armonica, Roellig, or Kirchgaessner.[??? Kchel, Beethoven's Letters 1790-1826, Vols. I & II); 'Project Gutenberg' (http://www.gutenberg.org/etext/13065); performed a text search for 'armonica', 'armonika', 'roellig', 'rollig', and 'kirch'. No mention of either the armonica, Roellig, nor Kirchgesnner. Beethoven did write a small Melodrama for the armonica in 1815, but it would appear that it wasn't important enough to warrant mention in his correspondence.]

The Allgemeine Musicalische Zeitung for April 1805[col. 432] mentions a Kirchgaessner concert ("her last before her departure for Breslau") and a repetition of a new symphony in D (no. 2) by Beethoven ("performed this time with much greater precision")—both concerts taking place in Vienna.

In 1815 Beethoven was commissioned to write the incidental music (Op.202/WoO 96) for a tragic play written by Friedrich Duncker (the King of Prussia's secretary) called Leonore Prohaska [Thayer, 619]. The play "tells the story of a maiden who, disguised as a soldier, fought through the war of liberation." Among the movements for your usual Beethoven orchestra and chorus is a short little "Melodrama" for armonica and narrator-at the point in the play when the heroine Leonore is speaking to her true love from beyond the grave. The narration (written by Duncker) is as follows:

> I entwined for you
> Two flowers: one for love, and one for constancy.
> Alas! All I have for you now are death's flowers!
> And yet, from the earth on my tomb
> The lily and the rose bloom anew. [1]

Due to financial problems the production of the play never occurred, so the piece wasn't performed in Beethoven's lifetime.[??? verify]

Mendelssohn

Daran wird auch Mendelssohn auf seiner intensiven Suche nach einer Harmonika, nebst Spieler, für eines seiner symphonischen Werke gescheit-

[1] Du, dem sie gewanden,
es waren dein zwei Blumen für Liebe und Treue.
Jetzt kann ich nur Todtenblumen dir weihn.
Doch wachsen am meinem Leicherstein
Die Lilei und Rose auf's neue.

ert sein (Brief an den Musiklehrer Helwig vom 1. Januar 1837; GB-Lbm/bl, Add.MS.33965, s. 225ff.), der Lucia aus ähnlichem Grund ohne Harmonika stattfinden mußimte.

Donizetti

Donizetti's *Lucia de Lammermoor* operatic mad scene was originally written for the armonica in 1836. Unfortunately by that time the instrument's popularity was waning and no one could be found capable of playing the music as written, so the composer rewrote it for flutes.

??? Tchaikowsky

Tchaikowsky's first draft of *The Nutcracker* (1891) called for a glass armonica for the 'Dance of the Sugar Plum Fairies'. [Sterki, 97]

Subsequently Tchaikowsky visited Paris, and encountered a new orchestral instrument 'midway between a tiny piano and a Glockenspiel, with a divinely wonderful sound.' 'It's called a "Celesta Mustel"'. (Brown, David; Tchaikowsky, V. 4, The Final Years 1885-1893; Norton 1991, ISBN 0-393-03099-7, pg. 349)

Tchaikowsky substituted the celesta for the armonica in subsequent performances-perhaps because the celesta is louder than the armonica (there being no amplification yet), and because the celesta being a keyboard instrument it was far easier to find players.

??? Richard Strauss

??? Saint-Saens

??? Alban Berg

Other composers writing for the armonica (glass harmonica) include: Galuppi, Haydn, Jommelli, Martini.

Part VIII

'Creative' Uses of the Armonica

Franz Mesmer

Franz Mesmer (1734–1815) was German physician who developed a theory and clinical practice of 'animal magnetism' or 'mesmerism'. It's from Mesmer that we get the word "mesmerize". He owned a particularly fine glass armonica, played it well, and it was an integral part of his 'mesmerizing' practice. Mesmer, Franklin and Mozart were all Freemasons, a group that enthusiastically welcomed glass music for the promotion of human 'harmony'. Mesmer and Mozart knew each other, and Mesmer and Franklin knew each other (alas Mozart and Franklin never met).

Early Years

Mesmer was born in the village of Iznang, Swabia. After studying at the Jesuit universities of Dillingen and Ingolstadt, he took up the study of medicine at the University of Vienna in 1759. In 1766 he published a doctoral dissertation with the Latin title De planetarum influxu in corpus humanum ("The Influence of the Planets on the Human Body"), which discussed the influence of the Moon and the planets on the human body and on disease. This wasn't 'medical astrology', however-relying largely on Newton's theory of the tides, Mesmer expounded on certain tides in the human body that might be accounted for by the movements of the sun and moon.[Bloch, xiii] Mesmer apparently plagiarized[Pattie, 13ff.] his dissertation from a work by Richard Mead (1673–1754)—an eminent English physician and Newton's friend[1]. In all fairness, however, in Mesmer's day doctoral theses were not expected to be original.[2]

Soon after receiving his degree, Mesmer married Maria Anna von Posch, a wealthy widow, and established himself as a physician in Vienna. He lived on a splendid estate and patronized the arts.

[1] *De Imperio Solis ac Lunae in Corpora Humana et Morbis inde Oriundis* (On the Influence of the Sun and Moon upon Human Bodies and the Diseases Arising Therefrom.(1704). See Pattie, 16.

[2] Pattie, 13

Mesmer and the Mozarts

In 1768, when court intrigue prevented the performance of La Finta Semplice (K51) for which a twelve-year-old Mozart had composed 500 pages of music, Mesmer arranged a performance in his garden of Mozart's Bastien und Bastienne (K50), a one-act opera. It was performed at the Mesmer mansion on an autumn evening (the date remains uncertain) in 1768. [So we are told by two editors of Mozart's letters, but neither cites a source for this information (Deutsch (1966), 84; Anderson (1966) 1:105). The performance could not have taken place in his garden theater as it wasn't built yet- it likely took place in his house, perhaps in the garden room. (Deutsch, A Documentary Bio, 84)] While conducting, the composer sat at the keyboard, which he played as a member of the orchestra. [Buranelli, 54-55] Mozart later immortalized his former patron by including a joking reference to Mesmer in his opera *Cosi fan tutte*:

> This is that piece
> Of magnet
> The stone of Msemer
> Who originated
> In Germany
> And then became so famous [1]

As you'll recall, in 1773 father and son Mozart were in Vienna and encountered the armonica at Franz Mesmer's house. Leopold wrote home to his wife:

> Herr von Mesmer, at whose house we lunched on Monday, played to us on Miss Davies's harmonica or glass instrument and played very well. It cost him about fifty ducats and it is very beautifully made.[Letter from Leopold Mozart to his wife,

[1] Questo è quell pezzo
Di calamita,
Pietra mesmerica
Ch'ebbe l'origine
Nell' Alemagna
Che poi si celebre
Là in Francia su.
In France
(trans. Pattie, 33)

July 21, 1773; quoted from Anderson I:341-2]

A few weeks later Leopold brought up the armonica again, mentioning that Wolfgang himself tried playing Mesmer's instrument:

> Do you know that Herr von Mesmer plays Miss Davies's harmonica unusually well? He is the only person in Vienna who has learnt it and he possesses a much finer glass instrument than Miss Davies does. Wolfgang too has played upon it. How I should like to have one! [Letter from Leopold Mozart to his wife, August 12, 1773; quoted from Anderson I:343]

This would suggest that Mesmer purchased his armonica some time between 1768 and 1773-this instrument became his favorite for the rest of his life. He also played the violoncello and the clavichord. Visiting musicians included Gluck[??? In Vienna?], Haydn, and other members of the Mozart family.[Bloch, xiii]

Mesmer's musicales took place in the drawing room of the mansion or, if the weather was pleasant, in his open-air theater. He often took an instrumental part in an ensemble with the professionals, accompanying them through established classics like Purcell and Palestrina, introducing works by Gluck, Haydn, or lesser composers then exciting the Viennese ear. The audience usually included acquaintances knowledgeable enough about their host's vanity to ask him for a solo on the glass armonica, his own choice for a display of his virtuosity. [1]

Animal Magnetism

We know almost nothing of the medical procedures of Dr. Mesmer in this early period. Interestingly it's the letters of the Mozart family that give us glimpses of the treatment of a patient who was to become famous in the history of animal magnetism as one of its first successes: Miss Franziska Oesterlin, who was living in Mesmer's home in 1773. On August 12, 1773, Leopold Mozart wrote to his wife,

> Miss Franzl has again been dangerously ill, and blisters[???] had to be applied to her arms and feet. She is so much better

[1] Buranelli, 50

> now [They had expected her to die.] that she has knitted in bed a red silk purse for Wolfgang, which she has given him as a remembrance[Anderson, 1:343]

On August 21 Leopold wrote to his wife that Miss Franzl had a second relapse and recovered from it.

> It is amazing how she can stand so much bleeding and so many medicines, blisters, convulsions, fainting fits and so forth, for she is nothing but skin and bone.[Anderson, 1:346]

But Mesmer's treatments were ultimately successful—Wolfgang writes to his father on March 17, 1780 from Mesmer's garden on the Landstrasse:

> The old lady is not at home, but Franzl is now Frau von Posch and is here. . . she has grown so plump and fat—she has three children—2 girls and a young gentleman.[Mozart 584/19, trans. wz]

Franzl had married Mesmer's stepson, Franz de Paula von Bosch (Bosch and Posch were interchangeable names).[Pattie, 32]

Other successes with equally difficult cases—notably Professor Bauer[Pattie 46-47] and Baron de Horka[Pattie, 48ff]—established Mesmer's fame. However, the orthodox medical community considered him to be a charlatan.

Maria Theresa von Paradis

In 1777 he treated Maria Theresa von Paradis (also von Paradies) (1759-1824), the famous blind pianist for whom Mozart wrote a piano concerto (probably No.18 in Bb, K456, composed 1778). When Maria awoke one morning at the age of three years and seven months, she was totally blind. The parents called in the best medical talent in Vienna, who pronounced her incurable but treated her for several years anyway. They shaved her head and put plasters on it for two months. They applied leaches. Purgatives and diuretics were prescribed in abundance. In addition, thousands of electric shocks were given to her eyes (with Leyden jars)-the only result being that her eyes protruded from their sockets and were continuously spasming and turning upward. Nor was blindness her only affliction-she also suffered from melancholia and attacks of delirium.[Pattie, 57-58] (Not surprising, considering the 'cure' she was enduring.) In order to give their daughter a diversion, they provided music lessons, and she became a capable singer and keyboard player. The Empress attended her performance of Pergolesi's Stabat Mater in which she played the organ and sang, and was so moved that she granted the child, then 11 years old, a pension of 200 florins a year so she could continue her musical education.[Pattie, 58]

Mesmer had known Miss Paradis for several years, and told her father he could treat her protruding and spasming eyes with his newly discovered 'animal magnetism'. Privately, Mesmer thought he could cure her blindness. Treatment began January 20, 1777. By the fourth day her eyes resumed their normal positions, their movements subsided, and her previously dilated pupils became normal. Within a month apparently some vision had been restored. At best she was always extraordinarily sensitive to light, and having been blind from such a young age she had serious trouble making any sense of her new visual experience: the nose on the human face was absurd to her to the point of bursting into laughter (she might be right about that); she was surprised that pictures were flat and not three-dimensional; when she turned her eyes toward a window in daytime or a lighted candle at night, she experienced vertigo.[Pattie, 59] She also had trouble learning colors and judging the distances of objects.[Pattie, 60]

Partial restoration of vision did not bring happiness-it made her miserable. She asked her father: "Why am I not as happy now as I used to be? Everything that I see makes an unpleasant impression on me. I was much more calm when I was blind. . . If I am always going to be as excited when I see new things as I am now, I would rather return to my blindness."[quoted in Pattie, 60] When friends, relatives, or important people were brought to her, she often had attacks of fainting or uncontrollable weeping. When outdoors, she asked that her eyes be bandaged because the light caused vertigo. Before the partial restoration of her eyesight she had walked around her house unaided with complete confidence; now, she bound up her eyes and had to be led.

Worse, it ruined her playing. When she was blind she had played the most difficult music with the greatest accuracy, even while carrying on a conversation. With vision it was hard for her to play: she watched her fingers on the keyboard and played mostly wrong notes.

More medical experts were called in. At first reports of Mesmer's apparent success were glowing, such as that of Dr. Le Roux[Pattie 59], but the tide began to turn. Dr. Barth, Professor of Diseases of the Eye, had stated on two occasions that Miss Paradis could see, but then changed his mind and declared that she could not see after all.[Pattie, 61] Mesmer's medical enemies began to work on Maria's father: as her vision improved and her playing degraded she might lose her pension. Matters became so bad that swords were literally drawn in Mesmer's home-with poor Maria caught in the middle. Finally the father convinced Mesmer to allow him to take Maria on a vacation "so that she might enjoy the benefit of the country air," promising to return her to his care. They never brought her back. Instead, Mesmer learned that her family was saying that she was still blind and subject to convulsions. "They compelled her to imitate fits and blindness," Mesmer wrote. "It was necessary, in the plans of her greedy parents, that this unfortunate girl should become blind again or appear so." He believed their motive was to retain the pension of 200 florins a year.[Pattie, 62-63]

She lived the life of a completely blind person for the rest of her days. For years she conducted a school of music for young ladies and was prominent in Viennese musical and intellectual society. She composed music including several operas that were staged in Vienna and Prague-none of which achieved any success. In 1784 she toured Europe and performed in Paris and London.[Pattie, 63]

During the rest of her life Maria Theresa had nothing to say about Mesmer apart from a passing reference in a letter in 1780 that her nervous system had been weakened "by the unsuccessful result of an eye treatment". She died in 1824 at the age of 65.[Pattie, 63]

After Miss Paradis returned to her parents and Mesmer found himself thoroughly discredited, without a single defender in the medical profession, he began to think about leaving Vienna. His departure was not hurried, nevertheless it was strongly encouraged by the medical and ecclesiastical community—Vienna at that time was in the Holy Roman Empire, and the ecclesiastical community had a lot of clout (they didn't call it the Holy Roman Empire for nothing!). Nevertheless, Mesmer was provided with a letter of recommendation from the Minister of Foreign Affairs to the Viennese ambassador in Paris, which shows that his government had not repudiated him.[Pattie, 66] He left Vienna about January 1778—he took his armonica with him but left his wife behind! She needed to stay in Vienna to manage her inheritance, and their relationship at this point seems to have been one of mutual indifference. Mesmer was never to see her again—twelve years later she died of breast cancer.[Pattie, 67]

Paris

He arrived in Paris in February of 1778 in the company of his valet and Dr. La Roux. He promptly rented an apartment in the Place Vendôme—a part of the city preferred by the wealthy and powerful. "He brought with him the robust conviction that he deserved the homage of all mankind, homage due to the discoverer of a new force in nature which wcould cure all diseases and would eventually displace conventional medicine. He had an imperturbable sense of his importance to the world without a trace of modesty or humility."[Pattie, 68]

November 1, 1779: "my armonica has not arrived and it is not possible for it to be here in time."[PBF 31:5]

There, in May 1779, he met Gluck, and enchanted him by his playing on the armonica. (Did Gluck tell Mesmer of his own concert on the musical glasses given in London forty-three years earlier?) Although Mesmer could play from printed music, Gluck was so impressed with Mesmer's improvisations that he urged him to confine his playing to extemporization. Apparently Mesmer was particularly fond of entertaining his guests with his armonica at twilight after dinner, and he took Gluck's advice to heart and rarely performed from printed music. When deeply moved by his own playing Mesmer used to sing at the same time. [King, A.H. "Musical Glasses and Glass Harmonica" p.110]

Paris at that time was certainly an excellent place for a physician, for Paris was filled with people suffering from many chronic diseases, untreated and untreatable. The population was ravaged by epidemics, of which smallpox was especially feared. It has been estimated that smallpox disfigured the faces of one fourth of the women of France, some 200,000 of whom took refuge in convents from the rejection they experienced because of their appearance. As a result, average life expectancy was about 40 years.[Pattie, 68-69]

The people of Paris were not as tightly controlled as the Viennese, who were dominated by the double dictatorship of Maria Theresa and the church. The French had considerably more freedom of speech; censorship of books was easily evaded. Mesmer began to practice medicine without asking the permission of any professional or governmental entity-how he managed to pull this off is not understood; certainly no French citizen could practice with such an exemption. Physicians who were graduates of faculties outside of Paris and wished to practice were required to pass examinations and defend theses in public disputations.[??? citation] Meanwhile, patients and curiosity-seekers flocked to him for treatment. Paris was soon divided into two factions: those who were sure he was a charlatan who had been forced to flee Vienna, and those who accepted his own self-evaluation that he had made a world-shaking discovery. In order to accommodate the throng of people who eagerly sought treatment with animal magnetism, Mesmer developed a method of mass treatment. Since he had discovered in 1775 that he could communicate animal magnetism to glass, water, and other substances and store it in them, he built a reservoir, the baquet, from which several patients could draw the healing agent at the same time. *Baquet* means tub, a word which lacks dignity; therefore the word is usually left untranslated.

Inside the wooden tub, which had a diameter of four or five feet, were bottles filled with water and laid on their sides and with their necks pointing to the center of the tub; they had been magnetized by Mesmer's stroking. To give more pressure to the magnetic fluid, a second or even a third layer of bottles could be placed over the first. The tub was filled with enough water to cover the bottles. Iron rods issued from the bottles and extended upward through the lid of the tub, bent so that they might be applied directly to the ailing parts by the patients, who stood in a circle around the tub. A cord could be passed around them, and sometimes they joined hands. A pianoforte or Mesmer's favorite instrument, the glass armonica, furnished music. The magnetism was propagated by the music, as Mesmer had discovered. [Pattie, 70-71]

Since Mesmer recognized the part suggestion and imagination play in the healing process and since he understood the influence of the surroundings on both, he took great pains to provide his patients with a setting in which they could be persuaded to submit to his technique. His whole purpose was to establish rapport with them, to gain their confidence and trust, and then, their nerves being now receptive, to introduce doses of animal magnetism into their bodies. Mesmer laid out his clinic as meticulously as if he were stage-managing a play. Only when he had the right conditions around him was he ready for the day's session. This was the sance of Mesmerism.

It began in a large room where dozens of patients could be taken care of at the same time in individualized and group therapy. The room at the Htel Bullion was an opulent, spacious one in which previous residents had entertained the beau monde of Paris. It had a lofty ceiling, inlaid floors, paneled walls, full-length mirrors, and oriel windows. The furnishings were in the best Louis Quinze style, from the artwork on the walls and tables to the chairs in which the patients sat while they were being magnetized.

Mesmer needed this elegant setting. The aristocrats who came to the clinic would feel at ease in the type of room familiar to them, while the poor would feel that they were being lifted by Dr. Mesmer above the hard and sordid lives they led. In either case, the setting aided the cure. Mesmer accepted all patients—there is no evidence he ever turned a patient away as being beyond help; if he could not cure, he could at least relieve their suffering. "He treated eye troubles, blindness, deafness, apoplexy, asthma, tumors of all kinds, skin and scalp diseases, migraine, and all the rest. Leprosy was to be treated 'like ringworm,' with magnetized water. The idea that he limited his practice to disorders of nervous origin is a common error."[Pattie 74-75]

During the séance Mesmer kept the doors and windows closed. Heavy drapes allowed only a dim light, and no noise to filter in from the outside. The atmosphere was warm and oppressive, causing labored breathing conducive to emotional excitement. Silence reigned except for whispers between patients and doctors (Mesmer or his assistants) in the give-and-take of diagnosis, treatment and prescription. One cardinal exception-the sound of a piano or glass armonica came from a corner of the room. Mesmer had learned from his Viennese teachers about the healing properties of music; he had stated in Proposition 16 of his memoir that animal magnetism “can be communicated, propogated, and reinforced by sound,” [Mesmer, F.A. Mesmerism: The Discovery of Animal Magnetism, tr. Joseph Bouleur, Holmes Publishing Group, Edmunds, WA, 1998, p. 27] and he combined the two ideas by placing instruments where his patients could hear and be moved by them.

He was not interested in melody as such when he placed musical instruments in the clinic. They were indispensable to his medical practice, swaying, disturbing, calming the ill. Stormy music helped bring on the Mesmerian crisis, and soft music helped allay it. The musician shifted from one to the other at a signal from Mesmer or an assistant. One of Mesmer’s followers, Caullet de Vaumorel, testified to the exquisite sensitivity with which the mood of the patients changed as the mood of the music changed. [Buranelli, 125-126]

Apparently Mesmer was effective. Sometime between 1778 and 1779 a Dr. Le Roux took an army surgeon (and thus presumably a hard-headed fellow) to Mesmer’s clinic for treatment of gout with which he had been afflicted for nine years. . .

> After several turns around the room, Mr. Mesmer unbuttoned the patient’s shirt and, moving back somewhat, placed his finger against the part affected. My friend felt a tickling pain. Mr. Mesmer then moved his finger perpendicularly across his abdomen and chest, and the pain followed the finger exactly. He then asked the patient to extend his index finger and pointed his own finger toward it at a distance of three or four steps, whereupon my friend felt an electric tingling at the tip of his finger, which penetrated the whole finger toward the palm. Mr. Mesmer then seated him near the armonica; he had hardly begun to play when my friend was affected emotionally, trembled, lost his breath, changed color, and felt pulled toward the floor. In this state of anxiety, Mr. Mesmer placed him on a couch so that he was in less danger of falling, and he brought in a maid who he said was antimagnetic. When her hand approached my friend’s chest, everything stopped with lightning speed, and my colleague touched and examined his stomach with astonishment. The

> sharp pain had suddenly ceased. Mr. Mesmer told us that a dog or a cat would have stopped the pain as well as the maid did.[Harsu, J. (1782) Recueil des effets salutaires de l'aimant dans les maladies. Quoted in Pattie, 73]

Mesmer also experimented on d'Eslon-Mesmer's "right-hand man"—by playing on the glass armonica or the piano and conveying animal magnetism to him. D'Eslon was obliged to beg for mercy about the music, presumably because of the discomfort caused by the charge of animal magnetism that it carried. [Pattie, F.A. (1994). Mesmer and Animal Magnetism, pg. 103]

Mesmer wanted official recognition for his discoveries—he considered himself more physicist than physician.[Pattie, 81] He approached the Royal Academy of Sciences; then the Royal Society of Medicine; then the Faculty of Medicine. He was rebuffed by all. Finally, he informed his patients that he would discontinue their treatments on April 15, 1781 and leave the country. One of these patients, the Duchesse de Chaulnes, complained to her friend Queen Marie Antoinette. The Queen proposed that a commission be established to investigate his claims, and if their report is favorable that he be recompensed (including a life annuity of 20,000 livres) and given official government sanction and support on the condition that he remain in France. Mesmer reluctantly agreed. Two weeks later the Minister of State, Jen-Frdric Phlipeaux, Count of Maurepas, met with Mesmer, and began by saying that the King, informed of Mesmer's dislike of being investigated by commissioners, wished to excuse him from that formality and would grant him a life annuity of 20,000 livres and pay 10,000 livres a year for a house suitable for the instruction of students. Mesmer repudiated his agreement to the Queen's offer and declined the King's.[Pattie, 110-111]

In 1784, the King appointed four members of the Faculty of Medicine as commissioners to investigate animal magnetism as practiced by Dr. Charles d'Eslon-Mesmer's foremost disciple. This commission had not been requested by Mesmer or any of his followers. The members of the commission were:

- Michel-Joseph Majault: a physician at Htel-Dieu, one of Paris' main hospitals. (Majault replaced Jean-Franois Borie, who had originally been appointed but died at the beginning of the investigation.)

- Charles-Louis Ballin: a professor of physiology, pathology, and pharmacology.
- Jean d'Arcet: a physician and chemist
- Joseph-Ignace Guillotin: physician, after whom the guillotine is named, although he didn't invent it—he championed it as a more humane method of executing the condemned (which indeed it was).

At the request of these commissioners, five additional members from the Royal Academy of Sciences were appointed:

- BENJAMIN FRANKLIN (!): now 78 and suffering from gout.
- Jean-Baptiste Le Roy: physician
- Jean-Sylvain Bailly: astronomer and he first mayor of Paris.
- Gabriel de Bory: geographer and previously governor of Santo Domingo.
- Antoine-Laurent Lavoiser: chief founder of modern chemistry[Pattie, 142]

Franklin and Mesmer had previously been acquainted. In a letter from Mesmer to Franklin, written sometime before November 1, 1779, Mesmer apologizes that his armonica isn't available.[PBF 31:5]. But that seems to be rectified, as Franklin and Mme. Brillon went to Mesmer's house in Paris to hear him play later that year. They were interested in Mesmer's armonica. That the visit was rather strained, with the guests trying to keep the conversation on music and their host trying to promote his medical theories is reflected by an exclamation of Madame Brillon in one of her many evocations of paradise, dated November 1, 1779: ". . . in heaven, M. Mesmer will content himself with playing the armonica and will not bother us with his electrical fluid!"[PBF 31:8] Mesmer wrote to Franklin on December 1, 1779[PBF 31:186], referring to some patients Franklin had seen-it appears that the genuineness of the cures was in question, and Mesmer promised to show him other patients when they were to dine together in the following week. Mesmer had given Franklin 12 copies of his Prcis historique (a tract Mesmer had written about animal magnetism) when it was published in

1781; Franklin gave them to his friends but still remained skeptical. On March 18, 1784, Franklin wrote to de la Condamine:

> As to the animal magnetism, so much talk'd of, I am totally unacquainted with it, and must doubt its existence till I can see or feel some effect of it. None of the cures said to be perform'd by it, have fallen under my observation[apparently he forgot those of 1779]; and there being so many disorders which cure themselves and such a disposition in mankind to deceive themselves and one another on these occasions; and living long having given me frequent opportunities of seeing certain remedies cry'd up as curing everything, and yet so soon after totally laid aside as useless, I cannot but feat that the expectation of great advantage from the new method of treating diseases will prove a delusion. That delusion may however in some cases be of use while it lasts. There are in every great city a number of persons who are never in health, because they are fond of medicines and always taking them, and hurt their constitutions. If these people can be persuaded to forbear their drugs in expectation of being cured by only the physician's finger or an iron rod pointed at them, they may possibly find good effects tho' they mistake the cause.[citation ???]

At the same time, one should consider the following anecdote about Franklin: In the spring of 1772, Franklin called on Prince Adam Czartoryski, heir apparent to the throne of Poland. His wife had been suffering from 'melancholia':

> I was ill, in a state of melancholia, and writing my testament and farewell letters. Wishing to distract me, my husband explained to me who Franklin was and to what he owed his fame Franklin had a noble face with an expression of engaging kindness. Surprised by my immobility, he took my hands and gazed at me saying: pauvre jeune femme ["poor young lady"]. He then opened an armonica, sat down and played long. The music made a strong impression on me and tears began flowing from my eyes. Then Franklin sat by my side and looking with compassion said, "Madam, you are cured." Indeed in that moment I was cured of my melan-

> cholia. Franklin offered to teach me how to play the armonica - I accepted without hesitation, hence he gave me twelve lessons.[tr. quoted from Lipowski, p.362]

Alas, several years later she seems to have relapsed. [Lipowski, 362ff.])

As soon as Mesmer learned that a commission had been formed to investigate animal magnetism as practiced by Dr. Charles d'Eslon, Mesmer wrote a letter to Dr. Franklin. He disavowed d'Eslon, stating that he had only an incomplete knowledge of animal magnetism.[Patie, 144]

Since the King's first members of the commission belonged to the Faculty of Medicine, the rival organization, the Royal Society of Medicine, asked to be represented, and the King authorized a second commission.[Patie, 143] Both commissions began their work promptly, and their reports were published about 5 months later. The first commission, of which Franklin was a member, carried out their experiments at Franklin's house in deference to his health. But d'Eslon's demonstrations broke down under the committee's examination when, for example, a patient who was supposed to feel the effects of animal magnetism was unable to tell—when blindfolded—whether the mesmerizer was present or not. The committee reported that Mesmer's results were due to his good salesmanship and the patient's imagination, and that his "animal magnetism" was really the faith of the patient. The second commission reported essentially the same findings.

In all fairness, the commission noted that Mr. Deslon used a piano, and not an armonica, to conduct the magnetism.[Franklin et al, trans. Silas 69] Perhaps the experiments would have succeeded had they used an armonica!

Opinions raged, books and letters were volleyed back and forth, and satirical plays abounded. Michel-Augustin Thouret (1748-1810), a docteur-régent (basically a senior physician) of the Faculty of Medicine, was commissioned by the Royal Society of Medicine to collect everything concerning animal magnetism in ancient and modern authors and to make a report on its origins. The result was his *Recherches et doutes sur le magnétisme animal* (Research and Doubts about Animal Magnetism); one of the precursors Thouret cited was our old friend Athanasius Kircher for his work on magnetism: *Magnes, sive de arte magnetica* (year???) (The Magnet, or the Magnetic Art).[Pattie, 161]

The committees' reports were the beginning of the end for Mesmer. Franklin wrote on April 29, 1785 that Mesmer was still working in Paris:

> It is surprising how much credulity still subsists in the world. I suppose all the physicians in France put together have not made so much money during the time he has been here, as he has done.[Pattie, 229???]

Mesmer still kept in touch with Franklin[See his letter of April 14, 1785 to Franklin].

Twilight

Mesmer left Paris later that year, aimlessly wandering around Europe until he was 'rediscovered' by a group of physicians in Berlin.[??? more Pattie, 231] By then D'Eslon had died (August 1786), and France had been caught up in the Reign of Terror: the King and Queen, and commission members Lavoisier and Bailly were guillotined. Perhaps the commissions actually did Mesmer a favor—due to their findings Mesmer had left France and missed the French Revolution altogether.

Around 1809 Mesmer ended up retiring in Frauenfeld in (what is now) his native Switzerland.[Pattie, 243] "He played his glass [h]armonica in a masterly manner with extensive improvisations, usually after meals and to honor a guest who was agreeable to him."[Pattie, 244] Mesmer was in good health until February 1815, when he complained of a general malaise, accompanied by retention of urine (in old men almost always due to hypertrophy of the prostate) [Pattie, 265-266]. On March 1 he suffered a stroke, and on the 5th, with the end imminent, he asked if his Catholic priest friend Fessler would come and play the glass armonica for him. The priest hurried to the bedside of the dying man, but Mesmer died quietly before he got there. Kerner (a biographer of Mesmer) says that the pet canary "neither ate nor sang again, and was soon found dead in its cage." [Buranelli, 203-204]

Mesmer was not a poor man. At the time of his death he was employing three servants, and had a horse and carriage. Soon after his death and before the estate was settled, Dr. Wolfart asked the heirs for the glass armonica, which he said Mesmer had promised him. It was sent to Dr. Wolfart, and has been lost. [Pattie, 267]

Phantasmagoria

The Magic Lantern

The 'magic lantern' is an early slide projector. People have been projecting images using concave mirrors and pin-hole cameras (camera obscura) since Roman times[Heard, 21]. But glass lens technology wasn't sufficiently developed to make slide projectors (or telescopes) until the 17th century. The first allusion to a 'magic lantern' is by Dutch scholar Christiaan Huygens (1629–1695) in the 1650s and he is generally credited with inventing it-though he didn't want to admit it, considering it frivolous.[Heard, 35] Whether he had actually invented it or not, Huygens introduced this curiosity to Thomas Walgenstein who realized its commercial value for entertainment and traveled through Europe-mostly France and Italy-demonstrating his machine to foreign princes and selling them replicas for their own amusement. In 1665 Walgenstein showed the device to Athanasius Kircher who described in his book Ars Magna Lucis et Umbrae (Great Art of Light and Shadow) published in 1671. [Heard, 35]

Until 1783 the only light source was lamps burning sperm or colza oil-not very bright at all, so images could only be projected for very small audiences. But in 1783 the Argand lamp was invented, which was considerably brighter, and the magic lantern really started coming into its own. [Heard, 38ff.]

Others used the magic lantern in sances and ghost shows, notably Johann Schrpfer (1730-1774) and Paul de Philipsthal (??-1829).[Heard, passim]

E.G. Robertson

[??? Charles Dickens, Household Words, January 27, 1855, p.554 "Robertson, Artist in Ghosts"]

Étienne-Gaspard Robertson (1763-1837)—originally 'Robert'—was born in Liège, Belgium, the son of a rich merchant. From an early age he was fascinated by the supernatural. Sent to Louvain to study philosophy, he began to develop a voracious appetite for the study of all branches of physics and the natural sciences, as well as proficiency in art. On his return to Lige he formed a close acquaintance with an optical instrument maker, Franois Laurent Villette (1729–1809). In his mid-twenties, Robertson had made up his mind to become a great painter—he had already won a gold medal. (All these skills would prove useful in developing his 'Fantasmagoria' shows.) Despite the protestations of his parents, who tried to encourage him to enter the priesthood, Robertson set out for Paris.[1]

On his way to Paris he saw a conjurer perform some magic, and with his background in physics he immediately understood how the trick had been done. The seed was planted.[Heard, 86] Initially supporting himself as a miniature portrait painter, and later by tutoring, his circumstances gradually improved. In his spare time he attended lectures in natural science at the College of France, and was eventually able to afford the relatively expensive lectures by Jacques Alexandre Charles (1746-1823)—who pioneered the use of hydrogen gas for balloon flight. Charles' flamboyant lectures were also seminal in Robertson's Fantasmagoria.

Robertson first came to public notice in 1796 when he proposed to the Directoire a scheme for burning up the British fleet with a gigantic assemblage of mirrors designed to concentrate the sun's rays on a distant object until it caught fire. [Female Thermometer, ???]

In 1792–3 Robertson apparently saw one of Phillipstahl's magic lantern shows[Heard, 87] and recognized the uncanny illusionistic potential of the new device, and with his usual flamboyance exploited the magic lantern's pseudo-necromantic power to new heights. He called it the

[1] Heard, 86

“Fantasmagoria” from “Fantasm”—“ghost”, and “agora”—“gathering”, so a fantasmagoria was a “gathering of ghosts”.

The first performance took place at the Pavilion de l’Èchiquier (in Paris) on January 23, 1798. An advertisement in the Journal de Paris (January 20) informs us:

> Fantasmagorie by citizen E-G. Robert-son: apparitions of Spectres, Phantoms and Ghosts, such as must appear or could appear in any time, in any place and among any people. Experiments with the new fluid known by the name of Galvanism, whose application gives temporary movement to bodies whose life has departed.An artist noted for his talents will play the Harmonica.[1]

When Robertson opened his show at 6pm, the 60 seats were soon filled. At a later performance he had to drop several items to accommodate the crowds. Robertson soon realized that not only was the theater too small, but that his fantasmagoria might make him rich and famous. An attendee describes the show:

> A decemvir [member of the ruling body] of the republic has said that the dead return no more, but go to Robertson’s exhibition and you will soon be convinced of the contrary, for you will see the dead returning to life in crowds. Robertson calls forth phantoms and legends of spectres. In a well-lighted apartment in the Pavilion de l’Èchiquier I found myself seated a few evenings since with some sixty or seventy people. At seven o’clock a pale thin man entered the room where we were sitting, and after extinguishing the candles he said ’Citizens and gentlemen, I am not one of those adventurers and impudent swindlers who promise more than they can perform. I have assured the public in the Journal de Paris, that I can bring the dead to life, and I shall do so. Those of the company who desire to see the apparitions of those who were dear to them, but who have passed away from this life through sickness or otherwise have only to speak and I shall obey their commands’. A moment of silence followed, and a haggard looking man with dishevelled

[1] Mannoni, trans. Crangle, quoted in Heard, 90 ???

> hair and sorrowful eyes rose in the midst of the assemblage and exclaimed 'As I have been unable in an official journal to re-establish the worship of Marat, I should at least be glad to see his shadow'. Robertson immediately threw upon the brazier containing lighted coals, two glasses of blood, a bottle of vitriol, a few drops of aqua fortis and two numbers of the journal des Homme Litres and there instantly appeared in the midst of the smoke caused by the burning of these substances, a hideous livid phantom armed with a dagger, and wearing the red cap of Liberty. The man at whose wish the phantom had been evoked seemed to recognize Marat, and rushed forward to embrace the vision, but the ghost made a frightful grimace and disappeared. Robertson threw onto the brazier a few sparrow's feathers, a grain or two of phosphorus and a dozen dried butterflies. A beautiful woman with her bosom uncovered and her hair floating about her soon appeared and smiled on the young man with the most tender regard and sorrow. A grave looking individual sitting alongside of me suddenly exclaimed 'Heavens! it's my wife come to life again', and he rushed from the room, apparently fearing that what he saw was a phantom.[Marion, 174-5].

One evening Robertson received an unplanned challenge: produce the phantom of Louis XVI. According to a journalist who attended, Robertson cleverly replied:

> I had a recipe for this sort of thing before the [French] Revolution but have now lost it. It is probable that I cannot ever find it again, and it is therefore impossible to bring back the Kings of France.[Quoted in Heard, 93]

Robertson claimed he never said it, one would think that his reply had deftly navigated the politics of his day, but the authorities shut down his show anyway. Mockingly, Robertson says: They searched everywhere where there might be any trace of a ghost, and at that point, I had the thought, confirmed before and since, that to run after shadows and to grasp at phantoms, in order to transform them into realities, often very fatal, is one of the principal means of the existence and one of the most frightful necessities of the secret police.[Robertson, p.6???] The authorities didn't find the evidence they were looking for, but neither did they allow him to reopen his show. So instead Robertson went to Bordeaux for a few weeks, giving presentations of his fantasmagoria there and enjoying his first balloon ascent. Finally returning to Paris, he discovered that the very same Pavilion de l'Èchiquier was now hosting a rival phantasmagoria show, the producers being the owner of the Pavilion and two of Robertson's former assistants. Robertson decided to re-launch his show on a more elaborate scale.[Heard, 94]

He chose the eerie Convent des Capucines. The convent and its chapel had been built in 1688, and abandoned by the nuns at the outset of the Revolution. "What more suitable place than a vast abandoned chapel in the middle of a cloister, littered with broken gravestones 'heaped up in hundreds' outside the church? Here his audience might imagine the ghosts arising in a disturbed passion from real sepulchers." Robertson's premier exhibition at the Convent occurred on January 3, 1799, at 7:30pm. As usual, the music was supplied by a glass armonica.[Heard, 94] The glass armonica was Robertson's favored instrument. He noted that it contributed 'powerfully to the effects of the fantasmagoria, in preparing not only the minds but the very senses for strange impressions by a melody so sweet that it sometimes gave great irritation to the nervous system'. The armonica can produce a somewhat monotonous sound, if desired, and Robertson put that to use: he observed that 'a uniform noise puts thought to sleep; all the ideas seem to concentrate on one and the same object and one and the same impression'.[Heard, 106]

Robertsons fantasmagorie at the Capucine convent was enormously popular—it ran for four years, and the Convent grounds became a center for other popular amusements.[Heard, 111-112]

Robertson's success naturally attracted competition in spite of the patent he filed in February of 1799. In 1800 he filed suit to shut down a rival show; there was a temporary injunction, but Robertson lost-because he hadn't personally invented any of the technology he was using, he simply had the imagination to use it in a new way-which wasn't patentable. Legal battles continued for another two years-in the end Robertson lost, with Robertson having to pay a negligible settlement. [Heard 114-115].

So in 1803 [???] Robertson took to the road, largely occupying himself with ballooning, but as the reigning authority on fantasmagoria shows he still staged occasional exhibitions and dispensed private advice. Between 1803 and his triumphant comeback season of fantasmagoria shows in Paris in 1814, he visited Vienna, Prague, St. Petersburg, Moscow, Stockholm, Copenhagen, and the major cities in Germany.[Heard, 116]

He was also a balloonist, setting an altitude record in Hamburg in 1803. He later accompanied the Russian ambassador to China, where he demonstrated ballooning technique in the 1820's.[Female Thermometer, ???]

Various 'copy-cats' produced fantasmagoria shows throughout Europe, including England, where a popular effect was changing the image of the (British traitor) Benjamin Franklin into a skeleton[Altic, 218]! It's unknown whether these shows, which were not under Robertson's auspices—in England or anywhere else—were accompanied by the glass armonica.

Part IX

The Armonica Waxes

The Armonica in England

The music glasses became quite popular in England. Jackson's Oxford Journal for December 12th, 1761, contains the following:

> The Young Gentleman who has performed on the Musical Glasses, by permission of the Vice-Chancellor, takes this method of returning thanks for the great encouragement and kind reception he has met with: and to give notice that this day . . . will be positively the last of his performances at Oxford; and that early Monday morning he will set out for Bath, and purposes to stop that day at the New Inn at Abindgdon for the entertainment of the Ladies and Gentlemen of that town.[Source ???]

They were mentioned in Oliver Wakefield's popular novel of the day The Vicar of Wakefield (1761):

> They would talk of nothing but high life, and high-lived company; with other fashionable topics, such as pictures, taste, Shakespeare and the musical glasses. [Chapter 9. An almost identical quote is found in chapter 10.]

As we have seen, Marianne Davies performed on the armonica throughout Great Britain from early 1762 to 1764[question about their chronology], and in London from June 1767 to fall 1768. She seems to have returned to England around 1797-she doesn't appear to have performed any more. Schuman and Largeau were two other armonica players who performed in London from 1762–1767—little is known of them. [Pohl, M&H in London, 374]

In 1778 Frick arrived in London and apparently performed until around 1795 (when he experienced his spiritual conversion).

Kirchgaessner arrives in London in 1794 and performs until 1796 when she leaves for the Continent.

In Samuel Coleridge's play *Remorse* (1812), the beginning of Act III finds itself in an underground crypt with a sorcerer, and the script indicates 'soft music from an instrument of glass or steel."[Coleridge, Works of Coleridge, 378]. In 1818 Samuel Coleridge writes in Friends[Coleridge (1818), Section II, Essay 6]:

> A true musical taste is soon dissatisfied with the harmonica, or any similar instrument of glass or steel, because the body of the sound (as the Italians phrase it), or that effect which is derived from the materials, encroaches too far on the effect from the proportions of the notes, or that which is given to music by the mind.

I'm not sure I understand what he means (the rest of the essay isn't much help), but it's certainly clear he doesn't care for it!

I haven't found any further mention of glass armonica performances in England in the early 19th century—did the fact that it was invented by the British "traitor" Benjamin Franklin have something to do with that? Meanwhile, performances on the musical glasses in variety shows are frequent.

The Armonica in Italy

As you'll recall[see ???], Franklin wrote to Beccaria in July of 1762 describing his new musical invention, which he had renamed to the new Italian name armonica. Franklin's long-time correspondence with Beccaria rarely diverged from scientific and personal matters, so Franklin's long description of the armonica is rather out of character. We surmised that Beccaria, who had so effectively championed Franklin's ideas about electricity throughout Europe, would prove an equal champion for his new musical invention. Franklin was not very well known in Europe yet so he didn't have a long list of options. "[Franklin] was convinced that the armonica was an important addition to the family of musical instruments, and that it was destined perhaps to supersede the harpsichord and piano. Hence, as previously with his stove and lightning rod, he must have been anxious to see humanity blessed with the new invention as soon as possible. That intent could obviously be no better served than by having his instrument adopted and cultivated in the land that was the musical Mecca to which the western world still turned for diversion and instruction. What then more logical than for him to dedicate his new instrument to a prominent Italian in order to take advantage of Italy's musical hegemony? An Italian name for the invention, along with a national compliment or two for good measure, was probably calculated to contribute further to put the Italians in a receptive mood."[Pace, 273-274]

If that was Franklin's plan, it didn't work well. Beccaria was interested in literature, painting and sculpture—but not music. Consequently, Franklin's letter of 1762 was not published in Italy until 1769, and only then due to the efforts of the distinguished historian and Latinist Baron Guiseppe Vernazza. It wasn't printed again until the mid 1770's, exhumed presumably due to the concertizing of Marianne Davies, who arrived in Italy with her sister in late 1770/early 1771.

Beccaria's letter of May 20, 1771 which serves as an introduction to his Artificial Electricity opens with elaborate thanks:

> I thank you, distinguished Sir, for the exact description of your new and truly harmonious crystal clavichord (thus it is granted you to illumine the mind of man with the principles of the new electrical science, to reassure his spirit against the horror of strokes with your [lightning] conductors, and to soothe his senses with sweet and pathetic music); and if I were capable, I would thank you in the name of our Italy for having, as you say, given your worthy instrument the name of Armonica precisely because of our harmonious language.[PBF 18:109ff] Artificial Electricity was a revised and expanded edition of the book on electricity (based on Franklin's ideas) that he had written two decades earlier. There isn't much connection between a musical instrument and electricity, but Franklin's description of the armonica had recently been published in English, and translated into Italian (both in 1769[PBF 18:109]); the armonica was in the public eye thanks to Marianne Davies, and Beccaria may well have wanted to use his connection with the increasingly famous inventor to advertise his new edition. The correspondence between the two Milanese brothers Counts Pietro and Alessandro Verri in the end of the eighteenth century gives us a window into the history of the armonica in Italy. English travelers had brought musical glasses to Italy before Franklin's letter to Beccaria, and Pietro Verri, charmed by the sound, experimented with them himself before hearing the armonica. He had over one hundred glasses made

> and amused himself by playing simple tunes. But he wasn't happy with the results, because he could only play two notes at a time, and because the water tuning was not only troublesome, but interfered with the timbre and resonance.[Pace, 274ff]

One can thus easily imagine Pietro's excitement on hearing of the armonica from his brother Alessandro who was traveling in London. Alessandro's letters of recommendation and personal qualities gained him immediate access to London's most exclusive society during the three months he spent in England. Of course he had to visit Franklin, who had returned to London in 1764. And we find Alessandro writing home to his brother on January 27, 1764:

> I have been to see the Newton of electricity, the famous Franklin. He is a man of over fifty years of age. You know that by pressing and sliding a moistened finger over the edge of a glass a sound is produced. He has made the instrument on this principle. He has strung on a spindle, or common axis, as many glass bells as correspond to the pegs of a harpsichord, proportionately graduated. The spindle turns by means of the left foot, with a wheel, as the knife grinder does. At the same time one touches with the fingers, as one does a harpsichord the bells which spin like wheels, after having first wet them slightly with a sponge. A melody comes out which goes to the heart... [Veri (1923), 1(1): 234; quoted in Pace, 275]

A year and a half later Pietro writes that he is determined to own an armonica. English general Henry Humphrey Evans Lloyd had paid him a visit in early 1768 and returned to England. Pietro writes:

> Lloyd is having sent to me from London an armonica, which is the instrument that you saw at Franklin's. Within a month it should be at Genoa. He tells me that the basses are so powerful that they make the air vibrate and the windows of the room tremble. Tell me if you found it so. This winter an Englishman has been with us who played on the glasses, but it was not the device of the armonica. There were thirty-two glasses fixed motionless on a table and with a determined amount of water. By rubbing the fingers over them, a rather

> pleasing sound was produced. The chiaroscuro and expression are superb. There is no brilliancy, but there is the most touching passion, and I was enchanted with it. If the armonica produces a similar effect, I shall be satisfied. [Veri (1923), 1(2): 363-364; quoted in Pace, 275-6]

Alessandro replied promptly:

> The London armonica must be precisely the one that I saw at Franklin's. It seemed delightful to me. There are a number of graduated glass bowls strung on an axle which, placed in horizontal position, is spun with a pedal. One moistens his hands with a sponge and plays as on the keys of a harpsichord. The Marquise has also heard the instrument with the thirty glasses and says that at first she was ravished with delight, and finally she was bored. I believe that this is so because it does not sustain the tone, and, after the strokes, the sounds continue and become confused. There are none of these inconveniences in the armonica. Franklin played only a rather simple minuet for me, but I liked it very much. What charmed me was to hear a sweet and aerial sound without being able to determine the place it came from, because there is no striking of strings, nor hiss of breath, which in other instruments determine the seat of the sound and make it harsh. This is a human voice, but of greater mellowness and sweetness. I hope that you will get much pleasure from it. [Veri, 1(2): 375; quoted in Pace, 276] Poor Pietro couldn't know that he destined to never have an armonica. By the end of 1771 he had concluded that Lloyd had forgotten his promise.[Veri (1919), 4: 291, Pace 276] Marianne Davies' visit to Milan at about this time must have fueled his desire and frustration. His remark: "At the present time there is an English-woman who plays it [the armonica]; it's heavenly" must refer to Marianne Davies. [Veri (1919), 4: 291, Pace 276]

Obviously inspired by Marianne Davies, Pietro made one more attempt, this time through his brother who had connections in England. In December, 1771, Alessandro commissioned his London agent to furnish an armonica, but he warned Pietro that no merchandise had ever reached him from London in less than eight months.[Veri 4:303, Pace 276] In January 1772 Alessandro reported that a friend of his "just come from London had seen the armonica played by poor women circulating bout the cafs, and on such evidence assured his brother that the instrument could not be very expensive."[Pace, 276-277] In February, Alessandro's London agent informed that he would talk with Franklin immediately about an armonica for Pietro.[Veri, 5:25] Alas, a month later the London agent reported:

> We went to the workman who made several of the well known armonicas for this Dr. Franklin, the inventor, but he said that he is so weary of that work that he would not undertake another at any price. Hence there remains only to whether there is in London some other mechanic capable of such things. . . [Veri, 5:61-62, quoted in Pace 277]

Pietro's reply shows that he has come to appreciate the difficulties involved in constructing a good armonica, and has resigned himself to the likelihood that he shall never obtain one: It will take patience; and if an armonica is found, it will be something more than I expect. Dear Sandrino, I thank you for the trouble that you have taken. . . [Veri, 5:61-62, quoted in Pace 277]

After this, there is no further discussion of the armonica in the correspondence of the two brothers.

Scattered bits of information remain concerning the fortune of the armonica in Italy. Around 1772 the Milanese nobleman Count Lodovico Barbiano di Belgioioso, then retired to London after a strenuous military and political career in the service of Austria, wrote to Franklin to obtain the address of the workman who made glasses for the armonica so he can make one for the French ambassador[PBF 19: 305]. Due to the difficulty of playing the armonica, and the rumors of "nerve damage" one Abate Mazzuchi tried muting the bells in a case and playing with violin bows.[Pace, 281] In 1785, Franklin's curiosity was piqued by the report of the success of a "keyboard armonica" by an Abbé Perno, who to judge from his name, may have been Italian.

In 1790 the anonymous author of the Roman Anthology wrote:

> . . . all those who have heard it played confess that it is the most attractive, the most melodious, the most dramatic [in-

> strument] hitherto conceived, and that, with its tragic, penetrating, and pure sounds, and its sweet and harmonious concents[sic] that can be at pleasure maintained, strengthened, and made to die away imperceptibly, it is more capable than any other pinstrument[of moving, charming, and seducing souls and of making them fall into the most delicious reverie.[quoted in Pace, 281-282]

And in 1826, Lichtenthal—an adoptive son of Italy—advised that "the nervously infirm should not attempt to play it at all, the hale should play it in moderation because its excessively dulcet tones induce melancholia; and those in whom the darker bile tends to predominate should either shunt the instrument completely, or else play only sprightly tunes on it."[Pace, 282]

The Armonica in France

In the mid-eighteenth century there had been a concerted effort among the *philosophes* in France to combat ignorance and superstition by gathering together every scrap of known scientific knowledge and publishing it. One of these efforts was a 35-volume landmark Encyclopdie edited by Denis Diderot and Jean d'Alembert (appearing in installments between 1751 and 1780). The musical glasses were sufficiently popular to receive an entry (quoted here in full):

> Glasses, musical, (Arts) For many years one has imagined producing, with the help of glasses, a new type of harmony, very pleasing to the ear.
>
> It is claimed that it is an Englishman named Puckeridge who is the inventor; however this method is known for a long time in Germany. The instrument which is useful for this effect is an oblong quarre[???] box, in which are arranged & fixed several round glasses of different diameters, in which one puts water in various quantities. While rubbing with the wet finger on the edges of these glasses which are a little rentrans[???], one draws some from them very-soft, very melodious & very-constant sounds; & one can play extremely

> pleasant airs in this manner.
>
> The Persians have for a long time a nearly similar way of producing sounds; it is while striking with small sticks seven porcelain cups filled with a certain quantity of water, which produces harmonies. [1]

In 1765 the Davies performed in Paris[??? citation], which would appear to be France's introduction to this instrument. 1778 found the Davies sisters in Paris, but Marianne appears to be plagued by "ill health" and presumably didn't perform.

Kirchgaessner never performed in France.

Mesmer arrived in Paris with his armonica in 1778. Mesmer didn't give public performances on his armonica, but it was a prominent feature of his well-known "animal magnetism" treatments. Mesmer left Paris in 1785. He returned briefly in ????

Robertson opened his Fantasmagoria in Paris in 1798; they continued until he left Paris in 1803. Chateaubriand writes of the musical glass that "the ear of a mortal can perceive in its plaintive tones the echoes of a divine harmony."[???]

Franz Liszt (1811-1886) in his biography The Life of Chopin (1851) of his colleague and friend Frederic Chopin (1810-1849) describes Chopin playing in his apartment, comparing it to the armonica:

> His apartment, invaded by surprise, was only lighted by some wax candles, grouped round one of Pleyel's pianos, which he particularly liked for their slightly veiled, yet silvery sonorousness, and easy touch, permitting him to elicit tones which

[1] Verres, musiqe des, (Arts.) on a imaginé depuis quelques anneés de produire à l'aide des verres une nouvelle espece d'harmonie, trés flatteuse pour l'oreille. On pretend que c'est un anglois nommé Puckeridge, qui en est l'inventeur; cependant cette mthode est connue depuis long-tems en Allemange. L'instrument dont on se sert pour cet effet est une bote quarrée oblongue, dans laquelle sont ranges & fixés plusieurs verres ronds de différent diameters, dans lesquels on met de l'eau en différentes quantités. En frottant avec le doigt mouillé sur les bords de ces verres qui sont un peu rentrans, on en tire des sons très-doux, très-mélodieux & très-soutenus; & l'on est parvenu à jouer de cette maniere des airs fort agréables.

Les Persans ont depuis fort long-tems une faon à peu-près semblable de produire des sons; c'est en frappant avec de petits bâtons sur sept coupes de porcelaine remplies d'une certaine quantité d'eau, ce qui produit des accords. Diderot's landmark (1765)???]

> one might think proceeded from one of those [h]armonicas of which romantic Germany has preserved the monopoly, and which were so ingeniously constructed by its ancient masters, by the union of crystal and water.[Liszt, 51-52]

George Sand (1804-1876), Chopin's long-time lover gave the armonica a brief appearance in her novel *La Comtesse de Rudolstadt* (1856). In her novel, the heroine Consuelo, in Vienna, wakes up to find herself in prison. She is rescued, only to be subjected to a Masonic-like ritual of initiation in which the armonica plays a role. Notice the extraordinary footnote Sand includes to explain the armonica to the reader:

> In this moment the doors of the temple opened while making a metallic sound, and the Invisible ones entered two by two. The magic voice of the armonica, this instrument recently invented [13], whose penetrating vibration was an unknown wonder to Consuelo's body, was made hear in airs, and seemed to go down from the cupola between open to the moonbeams and with the vivifying breezes of the night. . .
>
> (Note 13: Everyone knows that the armonica created such a sensation in Germany with its appearance, that modest imaginations wanted to see there the hearing of the supernatural voices, evoked by the [???]consécrateurs of certain mysteries. This instrument, considered magic before it became popular, was high during some time, by the followers of German Theosophy, with the same divine honors as the quadrant at the old ones, and than many of other musical instruments among primitive people of the Himalayas. They did of them one of the hieroglyphic figures of their mysterious iconography. They represented it in the form of one fantastic dream. Neophytes of the secret societies, which heard it for the first time, after the terrors and emotions of their hard trials, were so strongly impressed by it, that several fell in ecstasy. They believed they heard the song of the invisible powers, because the player and the instrument were hidden with more than the usual great care. There are extremely curious details on the extraordinary role of the armonica in the ceremonies of reception of illuminism.) (Sand, 472-473)

The Armonica in The Holy Roman Empire

The Holy Roman Empire (the "Heiliges Römisches Reich"), known from the 16th century also as The Holy Roman Empire of the German Nation, was a political conglomeration of lands which, at its height, contained most of the territory of today's Germany, Austria, Switzerland, Liechtenstein, Belgium, the Netherlands, Luxembourg, Czech Republic and Slovenia, as well as eastern France, northern and part of central Italy, western Poland and western Croatia. Its languages thus comprised not only German and its many dialects and derivatives, but also many Slavic languages and the languages that became modern French, Dutch and Italian. The Emperor's Catholicism did not preclude large numbers of other religious groups-Jews and Eastern Orthodox-from living within its borders at various times. The Empire was also the birthplace of the Protestant Reformation.

Emerging from the eastern part of the Frankish Empire after its division in the Treaty of Verdun of 843, it lasted almost a millennium until its dissolution by Napoleon in 1806. By the 18th century, when the Empire was already in decline, Voltaire famously ridiculed its nomenclature by saying that the Holy Roman Empire was neither Holy, nor Roman, nor an Empire. For most of its existence, the Holy Roman Empire was more akin to a confederation of sovereign states than a state in and of itself. In the concept of the Reich (or 'Empire')[The Holy Roman Empire was the "First Reich"; the German Empire, from 1871–1918, founded by Bismark and brought to an end by Germany's loss of WWI was the "Second Reich". The Third Reich is of course infamous.] was included not only the government of the territory, but strong Catholic connotations (thus the holy prefix). Until 1508, German Kings were not considered Emperors of the Reich until the Pope had formally crowned them as such.

All this helps explain why there was abundant nobility in the Holy Roman Empire to be patrons to Mozarts and Kirchgaessners, musicians' (sometimes tacit) Catholicism, and the relative political ease with which musicians traveled in that region.

Though the armonica was invented in England, it's really in the Holy Roman Empire that it found its home—embraced and loved like nowhere else.

The instrument soon aroused widespread interest. The *Hanoversche Magazin* and the *Leipziger Wöchentliche Nachrichten die Musik betreffend* both contained descriptions of it as early as 1766.

1768 Marianne Davies performed in Vienna [??? Or 1769].

1769 Frick tours throughout Germany

1773 Frick tours Germany again, (Hamburg in February), and leaves for Russia

1776 or 1777 Frick returns to Germany from Russia

1778 Frick leaves for London

1780 Roellig takes up the armonica and goes on tour

1781 Roellig performs in Hamburg

1782 The *Almanach für Deutschland auf das Jahr 1782* ("Almanac for Germany for the year 1782") mentions among "clever instrumental artists in Germany" who performed on the Armonica one Fricke, Court Organist of the Markgraf von Baden-Baden, and a certain Röllig and Kirchgaessner.[Sonneck, Suum, 66] The *Musikalischer Almanach für Deutschland auf das Jahr 1782* ("The Musical Almanac for Germany for the year 1782") said:

> Of all musical inventions, the one of Mr. Franklin has created perhaps the greatest excitement. Concerning the way of producing tones, it is an entirely new kind of instrument. [Suum Cuique p.63]

1787: Roellig's *Über Die Harmonika: Ein Fragment*

1788: Roellig performs in Hamburg

1791: Kirchgaessner performs in Vienna; Mozart composes his quintet (K617) for her; Roellig moves to Vienna

1792: Kirchgaessner performs in Prague, Dresden, Leipzig, Berlin, Hamburg and Magdeburg

1796: In November Kirchgaessner performs in Hamburg in November and December

1801: Kirchgaessner performs in Hanover and Frankfurt

1804: Kirchgaessner performs in Leipzig. Roellig dies in Vienna

1805: Kirchgaessner performs in Berlin and Breslau

1806: Kirchgaessner performs in Vienna.

1808: Kirchgaessner performs in Prague; Kirchgaessner & Goethe meet.

1809: Kirchgaessner performs in Stuttgart, dies in Schaffhauser.

1813: E.T. Hoffman publishes a review of Beethoven's Piano Trios, Op. 70[AMZ, 15:3, March 1813, 141–54, quoted in Hoffman, ed. Charlton, p. 300ff.??] in which he says of a certain passage in the Beethoven piece:

> If these sextuplets are played with a dexterous light touch with the soft pedal down and the dampers raised, a susurration is produced that recalls the aeolian harp and the glass harmonica and has a quite wonderful effect when combined with the bowed notes of the other instruments.

To the soft pedal and the sustaining pedal the reviewer added the so-called harmonica pedal. The Germans added a pedal to their pianos called the "String Harmonica" or the "Harmonica Keyboard Glide"—the keyboard would slide over a tiny amount that resulted in only two of the three strings being struck by the piano (the third would sympathetically vibrate), making the sound quieter and more ethereal. It's still present on modern grand pianos, except that the hammer now strikes only *one* of the three strings when the pedal is depressed—it's now called the *una corda* pedal.[1]

1815: Beethoven composes his *Melodrama* for the glass armonica

1819: A letter by Kapellmeister Johannes Kreisler appears in Der Freimüthige[xvi, April 29 and 30, quoted in Hoffmann/Charlton 414ff]. First he discusses why the armonica is going out of fashion, and of the cause of all the 'fainting-spells' the armonica caused:

> Haude and Spener, in No. 31 of their journal[i.e. *Berlinische Nachrichten von Staats- und gelehrten Sachen*, March 13 1819] make it clear that Frau K[rickeberg]'s armonica playing was rather lacking in effect, and ask how it is that the

[1] See Harding, 44ff.

armonica in general is no longer so effective as formerly; perhaps our nerves have become hardened or softened, or perhaps the fault lies in our ear-drums, now that they have been spoiled by all the drum-beating, trumpeting, tromboning, and keyed-bugling. On the other hand the Freimthige fr Deutschland, in No. 62 of that journal,[March 27, 1819] calls the armonica the most beautiful and sonorous of all instruments, and praises the inspired fingers of this gifted artist which summoned forth the instrument's ethereal echoes.

I for my part, not having heard these ethereal echoes, must agree with Messrs. Haude and Spener that the astonishingly magical effect produced by the armonica years ago is now completely a thing of the past. But I am sure that our nerves have remained exactly the same, and that our eardrums, however battered they may be by drums and trumpets, are certainly still able to detect ethereal echoes too.

. . .

Now if the Freimüthige fr Deutschland calls the armonica the most beautiful and sonorous of all instruments, then as a hardened musician I would reply that from the musical point of view the armonica is one of the most feeble and imperfect instruments there are! Of the welter of trivial ariettas and variations and polonaises and other insipid trifles that are normally played on it I will say nothing except to remark that, to a finer ear at least, any melody on the armonica sounds stiff and wawkward. The fault lies in the instrument's mechanism, which makes it impossible even for the most practised player to connect the notes together in an artistic sense. This mechanism also precludes any rapid execution. On the other hand, the armonica affords the advantage of the organ, that the note continues as long as one's finger touches the glass. This property means that the characteristic quality of the instrument can be fully exploited only in slow music written in stric style.

Interestingly, swooning at the sound of the glass armonica seems to have been a method for women to attract men:

> Now if it is true that the armonica has such limited capabilities in music, then it is clear that the admiration and wonderment created by its novelty was aroused merely by its tone. . . In addition, the armonica's popularity rose during the period of delicate nerves, and when it was claimed that the armonica exerted a magical influence on the nerves, the instrument could not fail to captivate every sensitive soul. 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; she would have risked becoming an immediate object of indifference to any young man of refinement, however long he had courted her with amorous glances. Even ladies of more mature age fancied themselves transported back ten or fifteen years by all the pangs of blessed rapture, and received an heart and a novelette in the bargain! Of the use made of the instruments by Mesmer I prefer not to think!
>
> Now, it seems, the age of delicate nerves and swoons is just about over.

He concludes with a story worthy of Roellig:

> The best armonica player of recent times I have heard was a fine man of gentle and pleasing character who, returning home from the French war, resided for a few days in the same house as me. I am referring to none other than my inestimable friend, the Bashkirian Colonel Tetulow Pripop who, unjustly, has become little known in the musical world. This man was totally obsessed by the armonica which he found in my house; he played the whole day long, and was able to elicit from the instrument the strangest sounds on could ever hear; the melodies and chords he produced also rejoiced in the most amazing originality. The distinctive, inimitable sound which other good armonica players achieve only now and then, and which insensitive people claim to resemble the scraping of a knife across a window-pane, was so completely within the colonel's power that he was able to produce it uninterruptedly.
>
> The manservant to my dear Tetulow Pripop, a jolly young

> fellow with a most endearingly tigerish physiognomy, was so beside himself at his master's virtuosity that with loud howls he threw himself down and kissed his feet. Yet it was not surprising that this person was so deeply moved, since he too ws musically gifted and was able, when playing his long, narrow, Bashkirian pipe, to awaken trul idyllic sensations in the breast. One was momentarily transported to the most beautiful toad-pond a sensitive soul had ever sat beside.
>
> I will eternally remember the occasion when Tetulow Pripop played the armonica for the last time. Overcome by profound emotion, he had removed his large, pointed fox-fur capas well as three small caps he was wearing beneath it; he sat there in his red cape, conjuring forth the most exquisitely ethereal harmonies, at which his tiger was also moved to wail and moan dreadfully.
>
> Finally, as though in heart-breaking grief at the departure of their beloved friend, the majority of the glasses burst into pieces.
>
> Thereupon the Bashkirian Colonel Tetulow Pripop pulled on a pair of white kid-gloves and hurried away to his regiment.
>
> I have never seen the good man since.[Hoffmann/Charlton 418-19].

Schiller introduced it into his *Geisterseher (Sämmtliche Werke)*, edited by E. von der Hellen, 1904, Bd. 2, p.275) and in one of his letters wrote: "'Die Wirkung dieses Instruments kann in gewissen Situationen mächtig werden. Ich verspreche mir hohe Inspirationen von ihr (Bd. 2, p.423).'" [??? need years to put this in the chronology]

Other writers: Jean Paul (as in his *Hesperus*, *Titan*, and *Quuintus Fixlein*, Schubert and Wieland (cf. *Neue Deutsche Merkur, 1804*) were also enthusiastic.[???]

An indication of the 'heydey' of the glass armonica in Germany can be seen in the dates of publication of articles and reviews concerning the armonica in the *Allgemeine Musicalische Zeitung*:

[???]

The Armonica in Portugal

Richard Twiss in his *Travels through Portugal and Spain in 1772 and 1775* observes:

> I also heard [at Lisbon] a Portuguese lady's performance on the musical glasses, which were empty, but her fingers wer occasionally dipped in water. [1]

??? The Armonica In America

During colonial times, the social lot of the native-born musician was extremely low. Following the model of the ancient Roman Republic, which many colonialists wished to adopt, musicians were routinely counted among the least desirable elements of society. In one tabulation of civic worth, the musician was listed just one notch above the three most useless professions of all: the actor, the sausage maker and the perfumer. It was a rare occurrence for a person to make his living entirely from music in America during the eighteenth century. Most were forced to double up on their talents and offer their services in the manner of one instrumentalist who sought employment in 1767 by advertising in the Virginia Gazette that he "shaves, dresses hair and plays on the French horn."

Franklin rather shared this view: music made an excellent amusement but wasn't really a proper profession. [???]

Nevertheless, the landed gentry of Virginia, always well informed about the latest trends in Europe, showed an early interest in the glass armonica. Councillor Robert "King" Carter, probably the richest man in the colony and an avid musician, owned the only known glass armonica in Williamsburg. Carter ordered one of the new instruments in 1764 without ever having heard it. But he had heard about it from Bruton Parish Church's organist Peter Pelham: "Mr. Pelham of this Place is just returned from New York, he heard on that Journey Mr. B. Franklin of Phila: perform upon the Armonica: The Instrument pleased

[1] Twiss (1775), p.10

Pelham amazingly and by his advice I now apply to you, to send me an Armonica . . ." [Franklin played in N.Y.???]

Carter's instrument was probably the one Pelham played at a concert at Williamsburg's Raleigh Tavern on Thursday, May 2, 1765, when George Washington was in the audience. Although Washington's ledger book makes careful note of the 3 shillings 9 pence he spent for the ticket, there is nothing to indicate his opinion of the music.

The Carter children had a tutor, Philip Fithian, who was less reticent. It was Christmas 1773 when Fithian heard Mr. Carter play Water Parted from the Sea[Loesser, 438] upon it, and recorded his impressions in his diary:

> Weds. 22 Dec. (1773) ... Evening. Mr. Carter spent in playing on the Harmonica; It is the first time I have heard the instrument. The music is charming! The notes are clear and inexpressibly soft, they swell, and are inexpressibly grand; and either it is because the sounds are new, and therefore pleased me, or it is the most captivating instrument I have ever heard. The sounds very much resemble the human voice, and in my opinion they far exceed the swelling organ. [Quoted in Ervin, 339]

Other music lovers were similarly impressed. Thomas Jefferson was so enamored of the glass armonica that he made arrangements to buy one six octaves long. Unfortunately such a behemoth did not exist, three octaves being the maximum produced at that time by London musical instrument makers.[???] For some reason-perhaps the instrument's high cost-Jefferson never followed through on his purchase.

Nathanial Evans (1742-1767), one of America's earliest poets, was the son of a Philadelphia merchant. He was apprenticed to a counting house, but finding that life disagreeable he returned after his apprenticeship to the College of Philadelphia where, in 1765, "on account of his great merit and promising genius," he was awarded in an M.A. degree although he had never taken the B.A. degree. He then went to England and received ordination from the Bishop of London. In December of 1765 he returned to America and became an Anglican missionary in New Jersey. He died in 1767.

In 1763, he had occasion to hear Franklin's armonica in Philadelphia, and wrote a poem in praise of Franklin in general and the armonica in particular. While Evans was in London, the Chronicle printed it in the late summer of 1765. It was printed again in a collection of his poems (and one sermon), published by his friend William Smith five years after his death.[For a thorough history of the poem, see PBF 10:422ff.)

The last two stanzas of the poem concern the armonica:

> To Benjamin Franklin, Esq., LLD.
> Occasioned by hearing him play on the Armonica. Written in Philadelphia, 1763.
> . . .
>
> Aided by thee, Urania's heav'nly art,
> With finer raptures charms the feeling heart;
> Th'Armonica shall join the sacred choir,
> Fresh transports kindle, and new joys inspire.
> Hark! the soft warblings, rolling smooth and clear,
> Strike with celestial ravishment the ear,
> Conveying inward, as they sweetly roll,
> A tide of melting music to the soul;
> And sure, if aught of mortal moving strain
> Can touch with joy the high angelic train,
> 'Tis such a pure transcendent sound divine
> As breathes this heart-enchanting frame of thine.
> Shall not the Muse her slender tribute pay?
> Her's is no venal, but the grateful lay;
> Apollo bids it, where such virtues shine,
> And pours a graceful sweetness thro' each line.
> Her country too, responsive to the sound,
> Swells the full note, and tells it all around.

The first recorded public appearance of the armonica in the New World was in Philadelphia, December 27, 1764, advertised in Franklin's own Pennsylvania Gazette:

> For the benefit of Mr. Forage, and other assistant performers at the subscription concert in this city, on Monday, the 31st. of this instant December, at the Assembly Room in Lodge Alley, will be performed A CONCERT OF MUSIC: consisting of a variety of the most celebrated pieces now in taste, in

> which also will be introduced the famous Armonica, or Musical Glasses, so much admired for the great sweetness and delicay of its tone. Tickets at 7s. 6d. each.[1]

In April 1765 Washington recorded in his diary, "By my exps. To hear the harmonica 3.9: this was at Williamsburg.[???]"

In 1774 the *South Carolina Gazette* announced a concert in which "the vocal parts" were by "Signora Castella, who will also perform several airs on the harmonica."[2]

There is also an interesting notice in the *Pensylvania Packet* for October 17th, 1774, inserted by H.B.Victor,

> musician to her late Royal Highness the Princess of Wales, and Organist of St. Georges in London, mentioning "'a new instrument," a cymbaline de amour, which resembles the musical glasses played by harpsichord keys, never subject to come out of tune. [3]

At New York in 1793 was played. . .

> "A *Duetto* on the Harmonica by Messrs. Pick and Petit, and in 1794 a *Concerto* (by particular desire) on the Carillon, or musical glasses. Composed by Mr. (P.A.) van Hagen." [4]

In 1794 at Philadelphia John Christopher Moller took part in a quartet of his own composition for armonica, two tenors and 'cello.[5]

In 1795 at Charleston there were played at a concert which included symphonies by Haydn and Pleyel, and an overture by Gyrowetz, "*Pot Pourris* on the harmonia [sic] by Mrs. Pick": and in the same year at Petersburg a "sonata on the Italian Harmonica" was billed with sonatas by Pleyel and Clementi.

---

[1] Quoted in Sonneck, Suum, 68

[2] Quoted in: King (1949), p.108

[3] quoted in full in R.R.Drummond's Early German Music in Philadelphia, NY, 1910, p.29 This 'cymbaline de amour' presumably has something to do with Francis Hopkinson's improvement.

[4] Quoted in: King (1949), p.108

[5] King (1949), p.108

Part X

??? The Armonica Wanes

An early medical book said that listening to the sounds produced on glasses was “sure to cure certain maladies of the blood”.

But later, in 1798 Friedrich Rochlitz wrote in the Allgemeine Musikalische Zeitung, “There may be various reasons for the scarcity of armonica players, principally the almost universally shared opinion that playing it is damaging to the health, that it excessively stimulates the nerves, plunges the player into a nagging depression and hence into a dark and melancholy mood, that it is an apt method for slow self-annihilation Many (physicians with whom I have discussed this matter) say the sharp penetrating tone runs like a spark through the entire nervous system, forcibly shaking it up and causing nervous disorders.” He goes on to give some warnings:

If you are suffering from any nervous disorder you should not play it,

If you are not yet ill you should not play it excessively

If you are feeling melancholy you should not play it or else play uplifting pieces

If tired, avoid playing it late at night.

J.C. Muller warned in his instructional manual of 1788:

“If you have been upset by harmful novels, false friends, or perhaps a deceiving girl then abstain from playing the armonica-it will only upset you even more. There are people of this kind-of both sexes-who must be advised not to study the instrument, in order that their state of mind should not be aggravated.”

J.M. Roger’s Treatise on the Effects of Music on the Human Body (Paris, 1803) describes the melancholic timbre of the instrument as “plunging us into a profound detachment, relaxing all the nerves of the body”[Roger, p.277], while the author Chateaubriand writes of the musical glass that “the ear of a mortal can perceive in its plaintive tones the echoes of a divine harmony.”

When word began to circulate that there was illness attributed to the instrument, people began to panic, blaming the instrument for everything from domestic disputes, premature births, and mortal afflictions, to convulsions in dogs and cats. In certain German States it was banned by police decree “on account of injury to one’s health and for the sake of public order.”

Also, nineteenth century music was gravitating towards larger and larger orchestras performing in larger and larger halls. This certainly contributed to the louder piano replacing the quieter harpsichord. This certainly contributed to the demise of the armonica as well. In fact, a reviewer of the day complained about just this issue. Reviewing a concert by Marianne Kirchgaessner:

[???]

Nerve Damage?

Pohl-cursory notices.

Lütge (in 1925) gives us a lovely list of glass armonica victims. He asserts: ”nearly all virtuosos had to give up playing after a few years”[Ltge (1925), 102]. According to Ltge, the armonica carnage includes:

- The early death of the beautiful Ch. Fr. Bause
- The attempted suicide by the wife of Kupferstechers Stock
- The unlucky poverty of Bernhard Theodor Breitkopf (nerve-damage to the wallet?)
- Roellig (of course) suffered from ”nerves, twitching muscles, dizziness, cramps, tumors and paralysis of the limbs”

There’s no question that there were rumors about ’nerve damage’. Yet even contemporaries regarded this as silly. Rochlitz, a music critic of the day[AMZ, November 14, 1798] writes:

> ” I state: playing the armonica harms the health no more than playing any other expressive instrument.”

The whole tone of Rochlitz’s several-page article is to express amazement at the ’nerve-damage’ rumor that was apparently circulating at the time:

"I can find no harm in playing the armonica; so I am in no way in agreement with those who say it requires caution—no more than anything else which excites our feelings strongly.

Nevertheless, here are some precautions (even in 1798 one can't escape the legal disclaimers):

1. Patients with nervous-disorders, until they are cured, should not play they armonica—as they should also avoid everything that strongly excites their feelings and provokes their ill nerves.

2. If you are not ill you should not play it excessively. . .

3. If you are feeling melancholy you should not play it or else play uplifting pieces. . .

4. If tired, avoid playing it late at night. . .

5. Use cold water to moisten the glasses, and don't use too much water. . .

Rochlitz then concludes his article by chastising composers: "Why have you composed so little for this instrument? Could this be because of the small number of players and therefore the customers to be expected?. . . " Apparently, inflicting nerve-damage on players is not an concern!

Lead Poisoning?

One theory about the disappearance of the glass armonica is that its players got lead poisoning from touching the lead glass used to make the glasses. This theory has been quite popular and persistent.

What We Now Know About Lead Poisoning

We now know that lead poisoning occurs by ingesting or inhaling it. You can touch raw lead safely-just don't eat lunch after that without thoroughly washing your hands. This is according to OSHA[???], who, if anything, errs on the side of safety.

Go to your local fishing supply store (such as the fishing section in Wal-Mart) and you'll see lead fishing weights for sale. They are not packaged in any sort of special package to prevent you from touching the raw lead. That is because merely touching raw lead in and of itself does not pose any known health hazard[and lots of very skilled people have looked very hard at this issue]. And at your local tire store you'll see the tire mechanics balance your tires using lead weights—and their bare hands.

The nuclear industry needs to store hazardous nuclear waste for thousands of years and not have it leach into the water supply. Cost is a remote consideration. The best solution that all of our technology arrived at? Embed the waste in glass, in a process called 'vitrification'. Apparently no other material will prevent the nuclear waste from being leached into the environment by water as well as glass. If glass can keep nuclear waste from leaching into water over thousands of years, it seems likely that glass can keep lead from leaching into water for the few hours a month of playing time in a glass armonica players lifetime. Acids, over time, can leach the lead out of lead glass. So they recommend that you not drink alcoholic beverages (which are acidic) that have been stored in lead glass decanters for months at a time.

Lead is only absorbed through the skin when suspended in organic liquids like gasoline[???]—water, and glass, are not organic (in the chemistry sense of that word).

??? Lead Poisoning Around 1800

Lead poisoning was poorly understood in Franklin's day. And in fact Benjamin Franklin who was one of the first to realize the health hazard it posed.

??? Lead Poisoning and the Historical Armonica Players

It has been suggested that players got lead poisoning because they moistened the glasses by licking their fingers.[Hadlock, 525, footnote 31] But there is no mention in any of the historical literature of playing the armonica this way. Probably because it wouldn't work: short of rabies, a human being simply cannot produce nearly enough saliva to sufficiently moisten the sides of three-dozen glasses. As a player myself, I can't imagine why someone would even try, when a simple bowl of water is so much easier and-not gross!

"Prior to the twentieth century, lead-adulterated wines and spirits probably caused more plumbism [lead poisoning] than any other non-occupational source."[Warren, 22]

Why the Armonica *really* Disappeared

Part XI

Appendices

Bibliography

Primary

Written by a participant or eyewitness in the history of the musical glasses/armonica, or other relevant source of the period (almost always pre-1900).

– (1800, Jan.); "Über die fremden Künstler und Virtuosen..." ("Concerning Unusual Artists and Virtuosos"); *AmZ*

– (1802, Feb.); (Death Notice for Zumsteeg); *AmZ*

– (1804, Nov.); [Kirchgaessner review]; *AmZ*

– (1805, Jan.); [Kirchgaessner playing mentioned]; *AmZ*

– (1807, Feb.); [Kirchgaessner Review]; *AmZ*

– (1806, Mar.); [Kirchgaessner mention]; *AmZ*

– (1808, Jun.); [Kirchgaessner review]; *AmZ*

– (1809, Jan.); [Kirchgaessner death notice]; *AmZ*

Bacon, F. (1841); *The Works of Francis Bacon*; Montagu, B. (ed.); Carey & Hart; Philadelphia

Bacstrom, S. (1790(?) / 1960); *Bacstrom's Alchemical Anthology*; Hamilton-Jones, J.W. (ed.); Reprinted by kessinger.net

Bartl, F. C. (1796); "Nachricht von der Harmonika"; *Allg. Europ. Journal*

Bartl, F.C. (1790); *Über der Mechanismus zur Tastenharmonika*

Berlioz, H. & Strauss, R. (1991); *Treatise on Instrumentation*; Dover; New York; ISBN: 0486269035

Berlioz, H. & Strauss, R. (1842-1843); *Grand traite d'instrumentation et d'orchestration modernes*; Paris

Biester, J. E. (Hrsg.) (1787); "Nachricht von der Rölligschen Harmonika"; *Berliner Monatsschrift*

Bossler, H. P. C. (Hrsg.) (1789); *Musikalische Real-Zeitung, für das Jahr 1789 und Anthologie für Kenner und Liebhaber der Tonkunst.*; ND Hildesheim / New York 1971.

Bossler, R. (1809, May 10); "Mariane Kirchgessner in den letzten Tagen ihres Lebens" ("Mariane Kirchgessner in the last days of her life"); *AmZ*

Cicero (2001); *Cicero's Speech: Pro Rabirio Postumo*; Siani-Davies, M. (tr.); Clarendon Press; Oxford

Coleridge, S (1866); *The Friend*; Bell & Daldy; London

Coleridge, S (1903); *Works of Coleridge*; Campbell, J.D.; Macmillan & Co.; 1903

Cotterell, G., (ed.) (1975); *London Scene from The Strand*; Book Club Asso.; London

Crofton I. & Fraser D. (1985); *A Dictionary of Musical Quotations*; Schirmer Books; NY

Deutsch, O. E. (1966); *Mozart, A Documentary Biography*; Stanford U. Press; Stanford, CA

Deutsch, O.E. (1961); *Die Dokumente Seines Lebens*; Bärenreiter; Kassel

Eisel, J. P. (1738); *Musicus Autodidaktos*; Erfurt; Reprint on demand through astrologos.org

Farrand, M. (1949); *Benjamin Franklin's Memoires*; U. of California Press; Los Angeles

Ford, A. (1761, Nov. 2); "Instructions for playing on the musical glasses"; *Public Advertiser*; London

Franklin, B. (1959-present); *The Papers of Benjamin Franklin. New Haven*; Labaree, L. W. et al. (ed.); Yale University Press; 37 volumes of a projected 45 completed.

Franklin, B. (1905-1907); *The Writings of Benjamin Franklin*; Smyth, A. H. (ed.); New York

Franklin, B. (1746, Dec.27); *Pennsylvania Gazette*; Philadelphia

Franklin, B. (1868 / 1996); *The Autobiography of Benjamin Frnklin*; Dover; NY

Franklin, B. et al (1784); *"Rapport des commissaires charges par le Roi de l'examem du magnetisme animal. Im-prime par ordre du Roi, sur la Copie imprimee au Louvre. "*; sur la Copie imprimee au Louvre; Paris

Franklin, B. et al (1996); Rapport des Commissaires Charg'es par le Roi; *Skeptic Magazine*; Salas, C. & D. (tr.); Translation of Franklin et al's report to Louis XVI. With introduction by M. Shermer

Frick, P.J. (1797); *The True Knowledge of God and Man*; William Bryan; London; I am grateful to Cis van Heertum of the Bibliotheca Philosophica Hermetica in Amsterdam for sending me a photocopy of this extremely rare book.

Gaffurio (1993); *The theory of music*; Yale University Press; ISBN: 0300054971

Gafurius, F. (1492 /1967); *Theorica musicae*; Broude Brothers; NY; Facsimile of the 1492 Milan Edition

Galilei, G. (1954); *Two New Sciences*; tr. Crew H. & de Salvio, A.; Dover; NY; ISBN: 0486600998

Gluck, C.W. (1962); *Collected Correspondence and Papers of C.W.Gluck*; Hedwig & Mueller von Asow (ed.); Thomson, S. (tr.); St. Martin's Press; NY

Godwin, J. (collected & annotated) (1987); *Music, Mysticism and Magic*; Arkana; London

Gray, Thomas (1935); *Thomas Gray's Correspondence*; Toynbee P. / Whibley L. (Ed.); Clarendon Press; Oxford

Göcking, (1784); *Journal für Deutschland*

Harsdörffer, G. P., Schwenter, D. (1677 / 1991); *Deliciae Mathematicae et Physicae*; Keip; Frankfurt am Main; ISBN: 3805108028

Hoffmann, B. (1983); *Ein Leben für die Glasharfe*; Helmut Michel; Niederland

Hoffmann, E.T.A. (1989); *E.T.A.Hoffmann's Musical Writings*; Charlton, D; Cambridge U Press; Cambridge; ISBN: 0521543398

Horstig, K. G. (1799, Mar. 13); “Musterung der gewöhnlichen musikalischen Instrumente” (“Examination of the usual musical instruments”); *AmZ*

Howell, J. (1890); *The Familiar Letters of James Howell*; Jacobs, J.(ed.); David Nutt in the Strand; London; reprinted Kessinger (www.kessinger.net)

Jefferson, T. (1950); *The Papers of Thomas Jefferson*; Boyd, J, P. et al. (Ed.); Princeton

Kircher, A. (1673 / 1966); *Phonurgia Nova*; Broude Brothers; NY; Facsimile of the 1673 Kempten Edition

Kircher, A. (1684); *Vita Admodum Reverendi*

Klein, H. (1799, July); “Beschreibung meiner Tastenharmonika” (“Description of my Keyboard Armonica”); *AmZ*

Liszt, F. (1863 / 2005); *Life of Chopin*; Cook. M.W. (tr.); Dover; Mineola, NY

Mesmer, F.A. (1980); *Mesmerism: A Translation of the Original Medical and Scientific Writings*; Bloch, G.J. (tr.); Kaufmann Inc.; Los Altos, CA

Mesmer, F.A. (1998); *Mesmerism: The Discovery of Animal Magnetism*; Bouleur, J. (tr.); Holmes; Edmonds, WA

Mozart, L. & W.A. (1938); *The Letters of Mozart & His Family*; Anderson, E. (ed. & tr.); Macmillan & Co.; London

Mozart, W.A. (2005); *Briefe und Aufzeichnungen. Gesamtausgabe.*; Bauer, Wilhelm A. & Deutsch, Otto E.; Deutscher Taschenbuch Verlag; Kassel; ISBN: 3423590769

Müller, J. Chr. (1788); *Anleitung zum Selbstunterricht auf der Harmonika*; Leipzig

Müller, J.C. (1788 / 1995(?)); *A Self-Instruction Manual for the Glass Harmonica*; Fox, L. (tr.); Leipzig; Photocopy from Finkenbeiner. No copyright or publication notices.

Müller, W. Chr. (1796); “Beschreibung des Harmonicons, eines neuen musikalischen Instruments. ”; *Genius der Zeit, eine Monatsschrift*; Hg. A. Hennings.; Altona

Neri, A. & Merret, C. (1662 repr. 2004); *The Art of Glass*; Society of Glass Technology; Sheffield, UK

Newburgh, B. (1759 / 1972); *Essays, poetical, moral and critical.*; Rieland: Alex M'Culloh / Garland; Dublin / New York

Pilkington, J. C. (1706 / 1762); *The Real Story of John Carteret Pilkington*; London 1760 / Dublin 1762

Pliny (2001); *Natural History, Bk.36-37*; Eichholz, D.E. (tr.); Harvard U. Press

Pohl, C. F. (1862); *Cursory notices on the origin and history of the Glass Harmonica*; London

Pohl, C. F. (1862); *Zur Geschichte der Glasharmonika*; Wien

Quandt, Chr. Fr. (1797, März); "Ueber die Harmonika und ähnliche Instrumente nebst Bemerkungen über Harmonikaton überhaupt"; *Lausitzer Monatsschrift*

Read, R. (1660); *Secrets of Art & Nature*; Kessinger; reprinted by Kessinger.net

Robertson, E.-G. (1831); *Memoires recreatifs, scientifiques, et anecdotiques d'un physicien- aeronaute*; Paris

Rochlitz, F. (1798, Dec. 14); Ueber die vermeynte Schädlichkeit des Harmonikaspiels ("Concerning the injurious character of playing the armonica"); *AmZ*

Roger, J.L., (1803); *Trait'e des Effets de la Musique sur le Corps Humain*; tr. Sainte-Marie, E.; Chez Brunot; Paris

Röllig, C. L. (1787); *Über die Harmonica. Ein Fragment*; Berlin

Sand, G (1999); *La Comtesse de Rudolstadt*; ditions Ph'ebus; Paris

Schiller, F. (1904); *Sämmtliche Werke*; Hellen, E. von der

The Work of Benjamin Franklin (1882); ; Sparks, J. (ed.); London

Twiss, R. (1775); *Travels through Portugal and Spain in 1772 and 1775*; Robinson, Becket and Robson; London; Available as an online digital edition at http://www.ub.uni-bielefeld.de/diglib/twiss/travels/

Veri, P. & A. (1923); *Carteggio di Pietro e Alessandro Veri*; Novati, F. et al; Cogliati; Milan

Vernazza di Alba, G. (ed.) (1769); "L'Armonica Lettera del signor Beniamoni Franklin al padre Giambatista Beccaria regio professore di fisica nell'universitä di Torino dalF Inglese recata nell'Italiano"; *Experimenta, atque Observationes, quibus Electricitas vindex late constituitur atque Observationes,*; Turin; Turin 1769, p. 427-433 / Turin 1774, p. 437-443

Secondary

Written specifically about the musical glasses or armonica or an important figure in their history.

??? (); "Johann Gottlieb Naumann"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Angermüller, R. ; Rabin, H.M. (); "Paradis, Maria Theresia"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Aterman (2001); "Medical and Musical Byways of Mozartiana"; *JAMA*

Baldwin, O., & Wilson, T. (1995); "Davies, Cecilia"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.); Macmillan; London

Bartl, F. C. (1798); *Abhandlung von der Tastenharmonika*; Brünn

Becker, Skip (1998, Aug.); Benjamin Franklin and the Armonica; *Piano Technician's Journal*

Benz, E. (1977); Franz Anton Mesmer und die philospophischen Grundlagen des 'animalischen Magnetismus'; *Abhandlungen der Geistes- und Sozialwissenschaftlichen Klasse*; Mainz

Bergmann, Walter (1962, Mar.); "Gluck's Trio Sonatas (review); Eight Trio Sonatas by Gluck (review)"; *Musical Times*

Berner, A. (1995); "Harmonium"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.); Macmillan; London

Bernhardt, W. (1856); *Ernst Chladni als Akustiker*; Wittenberg

Besaraboff, N. (1941); *Ancient European Musical Instruments. An Organological Study of the Musical Instruments in the Leslie Lindsey Mason Collection at the Museum of Fine Arts, Boston*; Boston

Biggs, E. P. (1955-1957); “Benjamin Franklin and the Armonica”; *Daedalus Proceedings of the American Academy of Arts an Sciences*; Cambridge, MA

Blackburn, B.J. (2001); “Gaffurius [Gafurius], F.; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Blavatsky, H.P. (1988); *Isis Unveiled*; Theosophical U. Press; Pasadena, CA; ISBN: 0911500030

Bloch, T. (1988-89); *L'Armonica de Verre, ou Glassharmonica*; Conservatoire National Sup'erieur de Musique de Paris; Paris; ”Premier 'etat des recherches“

Bloch, T. (1992, Jul. 1); ”The Renaissance of the Glass Armonica“; *Glass Music International Inc. Journal*

Boyden, D. D. (1969); *Catalogue of the Hill Collection of Musical Instruments in the Ashmolean Museum*; Oxford; London

Brands, H.W. (2000); *The First American: The Life and Times of Benjamin Franklin*; Random House; New York; ISBN: 0385493282

Brosche, G. (Hrsg.) (1983); *Richard Strauss - Franz Schalk. Ein Briefwechsel. .*; Hans Schneider; Tutzing; ISBN: 3795203651

Buelow, G.J. (2001); ”Kircher, Athanasius“; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Bukofzer, M.F. (1947); *Music in the Baroque Era*; Norton & Company; NY

Buranelli, V. (1975); *The Wizard from Vienna: Franz Anton Mesmer*; Coward, McCann & Geoghegan; NY

Burke, J. (1976); *English Art 1714-1800*; Clarendon Press; Oxford

Castle, T. (1995); *The Female Thermometer: 18th Century Culture and the Invention of the Uncanny*; Oxford; Oxford

Chateaubriand, F.-R. (1852); *Les Natchez*; Administration des Publications Populaires; Paris

Chladni, E. Fl. Fr. (1821); *Beyträge zur praktischen akustik und zum Bau des Claviercylinders und damit verwandter Instrumente*; Leipzig

Chladni, E. Fl. Fr. (1787); *Entdeckungen über die Theorie des Klanges*; ISBN: 3746315190

Chladni, E. Fl. Fr. (1806); Über einige wesentliche Vervollkommnungen des Clavicylinders; *Leipziger Musikalische Zeitung*

Cohn, E. (1992); Benjamin Franklin and Traditional Music; *Reappraising Benjamin Franklin*; Lemay, J.A.; U. of Delaware Press; Delaware

Cox, J. (2000, Spring); "Williamsburg's 'Divine Orpheus'"; *Colonial Williamsburg*

Crawford, M.C. (1911); *Goethe and his Woman Friends*; Little, Brown, & Co.; Boston

Cripe, H. (1974); *Thomas Jefferson and Music*; U. Press of Virginia; Charlotesville

Darnton, R. (1968); *Mesmerism and the End of the Enlightenment in France*; Harvard U. Press; Cambridge, MA

Davis, W.B. (1987); "Music therapy in 19th century America"; *Journal of Music Therapy*

Day, C. R. (1977); *The Music and Musical Instruments of Southern India and the Deccan*; Delhi Publishing Corp.

Debus, A. (ed.) (1968); *World Who's Who in Science*; Marquis-Who's Who; Chicago

Deutsch, O. E. (1954, Dec.); "Neues von der Glasharmonika"; *Österreichische Musikzeitschrift*; Wien

Diderot, D., d'Alembert J. L. (ed.) (1765); "Verres, musique de"; *Encyclopedie ou Dictionnaire raisonne des sciences, des arts, et des metiers, par une societe des gens de lettres.*; Paris

Drake, Stillman (1970); "Renaissance Music and Experimental Science"; *Journal for the History of Ideas*

Drake, Stillman (1975, Jan-June); "The Role of Music in Galileo's Experiments"; *Scientific American*

Drummond, R. (1970); *Early German Music in Philadelphia*; Da Capo Press; NY

Drye, S.L. (1984); *The History and Development of the Musical Glasses*; Master's Thesis, N. Texas State University; Denton, TX

Ehrlich, C (1985); *The Music Profession in Britain Since the Eighteenth Century*; Clarendon Press; Oxford; ISBN: 0198226659

Einstein, A. (1979); *Mozart*; Oxford U. Press; NY; ISBN: 0195007328

Einstein, A. (1936 / 1964); *Gluck*; Blom, E. (tr.); McGraw Hill; NY

Elkin, R. (1955); *The Old Concert Rooms of London*; Edward Arnold, Ltd.; London

Ertelt, Th. (1993); *Alban Bergs Lulu. Quellenstudien und Beiträge zur Analyse*; Wien

Ervine, B. A. (1975); *"Francis Hopkinson Smith and His Grand Harmonicon"*; Ohio State University

Faruqi, L. I. (1981); *An Annotated Glossary of Arabic Musical Terms*; Greenwood Press

Federhofer-Königs, R. (); "Röllig, Karl Leopold"; *Die Musik in Geschichte und Gegenwart*

Findlen, Paula (2004); *Athanasius Kircher: The Last Man Who Knew Everything*; Routledge; New York and London

Finger, S. (2006); *Doctor Franklin's Medicine*; U of Pennsylvania Press; Philadelphia; ISBN: 081223913X

Finger, S. & Gallo, D. (2004); "The Music of Madness: Franklin's armonica and the vulnerable nervous system"; *Neurology of the Arts*; Imperial College Press; London

Finkenbeiner, G. (1986, Oct.); "The Glass Harmonica"; *The Journal of the Acoustical Society of America*

Finkenbeiner, G. & Meyer, V. (1987); "The Glass Harmonica: a return from obscurity"; *Leonardo*

Finkenbeiner, G. & Meyer, V. (1988); "The Glass Harmonica: A Return from Obscurity"; *Glass Music International Inc. Journal*

Franklin, B. (1949); *The Memoirs of Benjamin Franklin*; Ferrand, M. (ed.); UCLA Press; Los Angeles

Fraser, A. (2001); *Marie Antoinette*; Anchor Books; NY

Gallo, D & Finger, S. (2000); "The Power of a Musical Instrument: Franklin, the Mozarts, Mesmer and the Glass Armonica"; *History of Psychology*

Gibb, H.A.R, Kramers, J.H., Levi-Provencal, E., Schacht, J.(ed) (1960); *The Encyclopaedia of Islam*; Luzac & Co; London; Don't I have a copy of the relevant pages?

Godwin, J. (1995); *Music and the Occult: French Musical Philosophies, 1750-1950*; U. of Rochester Press; Rochester, NY

Godwin, J. (1995); *Harmonies of Heaven and Earth*; Inner Traditions International; Rochester, VT

Godwin, Joscelyn (1979); *Athanasius Kircher*; Thames & Hudson; London; ISBN: 0500810206

Goodden, A. (2006); *Miss Angel: The Art & World of Angelica Kauffman*; Pimlico; London

Gosse, P. (1952); *Dr. Viper: The Querulous Life of Philip Thicknesse*; Cassel & Company; London

Gravitz, M.A. (1997); "Mesmerism and Masonry: Early historical interactions"; *American Journal of Clinical Hypnosis*; Don't I have this?

Gravitz, M.A. (1997, Apr.); "Mesmerism and Masonry: Early Historical Interactions"; *Amer. J. Clin. Hypn.*

Grenander, M.E. (1972, Fall); "Benjamin Franklin's String Quartet"; *Early American Literature*

Guinard, T. (2002/2003, Winter te); "Tuning Musical Glasses"; *Diploma Project, Swiss Federal Institute of Technology*; Zurich

Gurdas (1986); *Gem Elixers and Vibrational Healing*; Cassandra Press; San Rafael, CA

Hadlock, Heather (2000); "Sonorous Bodies: Women and the Glass Harmonica; *Journal of the American Musicological Society*

Hall, M. (1990); *Benjamin Franklin & Polly Baker*; U. of Pittsburgh Press; Pittsburgh

Halsey, R.T.H. et al (1936); *Benjamin Franklin and His Circle: A Catalogue of an Exhibition*; Metropolitan Museum of Art; NY

Hammerich, A (Hrsg) (1911); *"Das musikhistorische Museum zu Kopenhagen. Beschreibender Katalog, deutsch von Erna Bobe.*; Kopenhagen

Hannes, A. (1975); *Glas Aus dem Bayerischen Wald*; Morsak; Grafenau

Harding, R.E. (1933); *The Piano-Forte*; Cambridge U. Press; Cambridge

Harding, Rosamond (1930 - 1931); "Experimental Pianofortes and the Music Written for Them"; *Proceedings of the Musical Association*

Harrison, J.F.C. (1979); *The Second Coming*; Routledge & Kegan Paul; London

Heard, M. (2006); *Phantasmagoria: The Secret Life of the Magic Lantern*; The Projection Box; Hastings

Heller, G.N. (1987); "Ideas, initiatives, and implementaions: Music therapy in America, 1789-1848"; *Journal of Music Therapy*

Heyde, Herbert (2001, Summer); "Ars Vitraria: Glass in the Metropolitan Museum of Art"; *Musical Instruments; Metropolitan Museum of Art Bulletin, New Series*; p. 52

Highfill, P.H. Jr; Burnim, K.A.; Langhans, E.A. (1978); *Biographical Dictionary*; Southern Illinois U. Press; Carbondale & Edwardsville

Hirsch, H. (1943, Okt. 9); "Mesmerism and Revolutionary American"; *American-German Review*

Hoffman, B. (2001); "Frick [Frike], Philipp Joseph"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Hoffman, B. (); "Röllig, Karl Leopold"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Holman, P. (2004); "Ann Ford Revisited"; *Eighteenth Century Music*; Cambridge U. Press

Horace E. (1956); "Notes on Franklin's Armonica and the Music Mozart Wrote for it."; *Journal, Franklin Institute*

Horst, L.D. (); "Rochlitz, (Johann) Friedrich"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Hosler, B. H. (1978); *"Changing Aesthetic Views of Instrumental Music in Eighteenth Century Germany"*; (Diss.) Univ. of Wisconsin

Humes, J.C. (1995); *The Wit & Wisdom of Benjamin Franklin*; Harper Collins; NY

Hunt, Edgar (1981, Mar.); "The World of Baroque and Classical Musical Instruments by Jeremy Montagu; (review) "; *Galpin Society Journal*

Hyatt King, A. (1956); "Some notes on the armonica"; *The Monthly Musical Record*; London

Hyatt King, A. (1946, April 2); "The Musical glasses and Glass Harmonica"; *Proceedings of the Royal Musical Association, 72d Session*; London

Isaacson, Walter (2003); *Benjamin Franklin, An American Life*; Simon & Schuster; NY; ISBN: 0684807610

Johnson, J.M. (1924); *Beginnings of Freemasonry in America*; Doran Co.; NY; Kessingerpub.com reprint

Jüttemann, H. (1978); *Die Schwarzwalduhr*; Klinkhardt & Biermann; Braunschweig

Karl Israel (1876); *Frankfurter Concert-Chronik von 1721-1780.*; Cahn, P. (Hrsg.); Frankfurt; ND der Ausgabe. Frankfurt 1986.

Karnath, Timothy A. (1979); *"The history of musical glasses in America, 1760-1830"*; Kent State U.; Kent, OH; OCLC: 7053666

King, A.H. (1995); "Musical Glasses"; *The New Grove dictionary of music and musicians*; Sadie, S. (Ed.); Macmillan; London

King, A.H. (2001); "Hoffmann, Bruno"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Kinsky G. / Halm H. (Hrsg.) (1955); "Zu Beesthovens Schauspielmusik zu ""Leonore prohaska"" vgl.; *Das Werk Beethovens, Them. bibliograph. Verzeichnis.*; München

Koldau, L.M. (); "Kirchgener, Kirchgessner, Kichgäner Mariane, Marianne, Marianna, Maria Anna (antonia)"; *Die Musik in Geschichte und Gegenwart*

Köchel, L. von (1969); *Chronologisch-thematisches Verzeichnis der Werke W.A. Mozarts*; Breitkopf & Härtel; Leipzig

Landon, H.C.R. (1999); *1791: Mozart's Last Year*; Thames & Hudson; NY

Landon, H.C.R. (1989); *Mozart: The Golden Years*; Schirmer Books; NY

Landon, H.C.R. (1991); *Mozart and Vienna*; Schirmer Books; NY

Lemay, J.A.L. (2006); *The Life of Benjamin Franklin*; U. of Pennsylvania Press; Philadelphia

Leppert, R. (1988); *Music and Image: Domesticity, Ideology and Socio-cultural Formaton in Eighteenth-Century England*; Cambridge U Press; Cambridge

Liang, T.-P. (1970); *Chinese Musical Instruments & Pictures*; Chinese Classical Music Asso.; Taipei

Lipowski, Z.J. (1984); "Benjamin Franklin as a psychotherapist: A fore-runner of brief psychotherapy"; *Perspectives in Biology and Medicine*

Loesser, A. (1954 / 1990); *Men, Women and Pianos*; Dover; NY

Lopez, C.-A, (1990); *Mon Cher Papa. In: Franklin and the Ladies of Paris*; Yale U. Press; London

Lopez, C.-A. (1981); *Benjamin Franklin's 'Good House'*; National Park Service; Washington, D.C.

Lüthge, W. (1925); Die Glasharmonika, das Instrument der Wertherzeit; *Der Bär*; Leipzig

MacLeod, C. (2002); *Inventing the Industrial Revolution*; Cambridge U. Press; NY

Mannoni, Laurent (2000); *The Great Art of Light and Shadow: Archae-ology of the Cinema*; Crangle, R. (tr. & ed.); U. of Exeter Press; Devon, England

Marek, G. (1969); *Beethoven*; Funk & Wagnalls; NY

Marion, F. (1885); *Wonders of Optics*; Quin, C.W. (tr.); Charles Scribner & Co.; NY

Martin, R. (2000); *Beethoven's Hair*; Broadway; NY

Matthews, B. (1975, Apr.); "The Davies Sisters, J. C. Bach and the Glass Harmonica"; *Music and Letters*

McConkey, K.M., & Perry, C. (1985); “Benjamin Franklin and Mesmermism”; *International Journal of Clinical and Experimental Hypnosis*

McVeigh, S. (1993); *Concert Life in London from Mozart to Haydn*; Cambridge Press; Cambridge

Merrill, Brian L. (2004); *Athanasius Kircher (1602-1680) Jesuit Scholar*; Martino Publishing; ISBN: 1578984327

Morgan, E.S. (2002); *Benjamin Franklin*; Yale U. Press; London

Moule, A.C. (1989); *A List of the Musical and Other Sound-Producing Instruments of the Chinese*; Frits Knuf; Buren, Netherlands

Mumford, L. (1963); *Technics and Civilization*; Harcourt, Brace & World; NY

Niemoeller, K.W. (1962); “Joseph Aloys Schmittbaurs Werke und ihre Wuerdigung im 18. Jahrhundert’; *Festschrift Karl Gustav Fellerer zum sechzigsten Geburtstag*; H. Hueschen (hrsg.); Regensburg

Niemoeller, K.W. (1962); ”Schmittbaur, Joseph Aloys“; *Rheinische Musiker*; K.G.Fellerer (hrsg.); cologne

Niemoeller, K.W. (); ”Schmittbaur, Joseph Aloys“; *New Groves Dictionary of Music*; Sadie, S. (ed.)

Niemöller, K.W. (); ”Schmittbaur [Schmittbauer], Joseph Aloys“; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

O’Donoghue, D.J. (1899); *An Irish Musical Genius, the Inventor of the Musical Glasses*; Gill & Son; Dublin

Otto E.D., Hatch, C. (1956, Apr.); ”Some Fallacies in Mozart Biography“; *Musical Quarterly*

Owen, B. (1987); *E. Power Biggs, Concert Organist*; Indiana U. Press; Boston

Pace, A. (1958); *Benjamin Franklin and Italy*; American Philosophical Society; Philadelphia

Pal’ezieux, N. de (1988); *Christoph Willibald Gluck*; Rowohlt Taschenbuch; Hamburg

Palisca, C.V. (2001); "Galilei, Vincenzo"; *The New Grove Dictionary of Music and Musicians*; Sadie, S. (Ed.)

Parton, J. (1864); *Life & Times of Benjamin Franklin*; Osgood & Co.; Boston

Pattie, F.A. (1994); *Mesmer and Animal Magnetism*; Edmonston, 1994; Hamilton, NY

Petersson, R. (1956); *Sir Kenelm Digby*; Harvard U. Press; Cambridge, MA

Piggott, F. (1971); *The Musical Instruments of Japan*; Da Capo Press; NY

Piotrowski, K. R. (1988); "Marianne Davies, the glass harmonica and nerve derangement"; *Glass Music International, Inc. Journal.*

Piotrowski, K. R. (1985, Dec.); "The glass harmonica and sacred music"; *The Amercan Organist*

Pohl, C. F. (1970); *Mozart und Haydn in London*; Da Capo Press; NY

Pohl, C.F. & Pisarowitz, K.M. (1995); "Kirchgessner, Marianne"; *The new Grove dictionary of music and musicians*; Sadie, S. (Ed.); Macmillan; London

Poirier, J.-P. (1993); *Lavoisier*; Balinski, R. (tr.); U. of Pennsylvania Press; Philadelphia

Poppe, G. (); "Naumann, Johann Gottlieb"; *Die Musik in Geschichte und Gegenwart*

Raines, R. (1967); *Marcellus Laroon*; Paul Mellon Foundation for British Art; London

Reckert, S. (); "Glasharmonika"; *Die Musik in Geschichte und Gegenwart*

Restle, K. (1998); "Richard Strauss und die Glasharmonika"; *Musica instrumentalis. Zeitschrift für Organologie.*; Nürnberg

Richard Strauss. Hugo von Hofmannsthal. Briefwechsel (1952); ; Strauss, A., Strauss F. (Hrsg.); Zürich

Robbins, H.C. (1976); *Haydn: Chronicle & Works*; Indiana U. Press; Bloomington & London

Robbins-Landon, H. C (1955); *The symphonies of Haydn*; London

Rochlitz, Fr. (1868); *Für die Freunde der Tonkunst*; Leipzig

Rosenthal, M. (12/1/1998); "Thomas Gainsborough's Ann Ford"; *The Art Bulletin*

Rosselli, J. (1998); *The Life of Mozart*; Cambridge U. Press; Cambridge

Rowland, Ingrid D. (2000); *The Ecstatic Journey*; U. of Chicago; Chicago; ISBN: 094305625X

Sachs, C (1920); *"Handbuch der Musikinstrumentenkunde"*; Leipzig; ND der 2. Auflage, Leipzig 1966 und Hildesheim 1971

Sachs, C (1940); *History of Musical Instruments*; New York

Sadie, S. (Ed.) (1995); "Paradis, Maria Theresa von"; *The New Grove Dictionary of Music and Musicians*; Macmillan; London

Sauvage, E. (2004, Dec.); "Les fantasmagories de Robertson: entre ¡¡spectacle instructif¿¿ et mystification; *Canadian Centre for German and European Studies*

Schiff, S. (2005); *A Great Improvisation*; Henry Holt & Co.; NY

Schlosser, J. (1984); *Die Sammlung alter Musikinstrumente*; Georg Olms; Hildesheim; ISBN: 348705177X

Schnapp, F. (Hrsg.) (1935); *Busoni. Briefe an seine Frau*; Zürich / Leipzig

Schneider, H (1985); *Der Musikverleger Heinrich Philipp Bossler*; Hans Schneider; Tutzing; ISBN: 379520500X

Scholes, P. (1970); *Oxford Companion to Music*; Ward, J.O.; Oxford U. Press; London

Sharrat, M. (1994); *Galileo: Decisive Innovator*; U. of Cambridge; Cambridge

Skousen, M. (0895260336); *The Compleated Autobiography of Benjamin Franklin*; Regnery Publishing; Washington, D.C.

Smart, Mary Ann (1992, Jul.); "The Silencing of Lucia"; *Cambridge Opera Journal*

Smith, J. (1829); *A Tutor for the Musical Glasses*; Edinburgh

Solomon, M. (1998); *Beethoven*; Schirmer Books; NY

Solomon, M. (1995); *Mozart: A Life*; Harper Perennial; NY

Sommer, R. (1920); "Alte Musikinstrumente"; *Bibliothek für Kunst- und Antiquitätensammler.*; Berlin

Sonneck, O. G. (1907 / 1978); *Early Concert-Life in America (1731-1800)*; Da Capo Press; NY

Sonneck, O. G. (1967); *Francis Hopkinson and James Lyon*; Da Capo Press; NY

Sonneck, O.G. (1916 / 1969); *Suum Cuique: Essays in Music*; Books for Libraries Press; Freeport, NY

Sterki, P. (2000); *Klingende Glaeser*; Peter Lang; NY; ISBN: 3906764605

Taricani, J (1979, Apr.); "Music in Colonial Philadelphia: Some New Documents"; *Musical Quarterly*

Thayer, A. W. (1973); *Life of Beethoven*; Princeton U. Press; Princeton

Thomson, K. (1977); *The Masonic Thread in Mozart*; Lawrence & Wishart; London

Ullrich, H. (1971); *Mariane Kirchgessner und Wien*; Hans Schneider Tutzing; München

Van Doren, C. (1991); *Benjamin Franklin*; Penguin; NY

van Heertum, Cis (1999); "Phillip Joseph Frick"; *Mededelingen van de Stichting Jacob Campo Weyerman*; Leiden, Netherlands

Vinchon, J. (1936); *Mesmer et son Secret*; Paris

Voegele (1956, April); "The Relation of Mesmer to Mozart"; *American Journal of Psychiatry*

Walmsley, D.M. (1967); *Anton Mesmer*; Robert Hale; London

Walters, K.S. (1999); *Benjamin Franklin and his Gods*; U. of Illinois Press; Chicago

Warren, C. (2000); *Brush With Death: A Social History of Lead Poisoning*; Johns Hopkins U. Press; Baltimore

Wood, G.S. (2004); *The Americanization of Benjamin Franklin*; Penguin Press; NY

Wright, E. (1986); *Franklin of Philadelphia*; Harvard U. Press; Cambridge, MA

Wyckoff, J. (1975); *Franz Anton Mesmer*; Prentice-Hall; Englewood Cliffs, NJ

Tertiary

Germane background information. The armonica/musical glasses or their important figures probably arent́ mentioned extitper se.

Altick, R.D. (1978); *The Shows of London*; Harvard U. Press; Cambridge, MA

Barteux, Ch. (); *Les beaux arts r'eduits und mme principe.*; [Paris, 1746] Paris, 1773. ND Genf 1969.

Benton, M.B. (); *"Shakespeare and the Musical Glasses"*; NOTE: Just a reference to the Goldsmith novel. No mention of the musical glasses in this article.

Bernsdorf, N. (1856-1861); *Universallexikon der Tonkunst.*; Bd. II, S. 324ff.

Bickerton, L.M. (1972); *Eighteenth-Century English Drinking Glasses*; Great Albion Books; NY

Bouasse, H. (1927); *Verges et plaques, cloches et carillons.*; Paris

Bowers, J. (1994, Spring); "Instrument und Korper: Die musizierende Frau in der burgerlichen Kultur by Freia Hoffmann" (review); *19th-Century Music*

Brancour, R. (1921); Histoire des Instruments de Musique; *pp. 233ff.*; Paris

Bray, C. (1995); *Dictionary of Glass*; U of Pennsylvania Press; Philadelphia; ISBN: 0812233573

Bryce, J.V. (1956); *The Holy Roman Empire*; Macmillan; London

Buckley, F. (1925); *Old English Glass*; Dingwall-Rock, Ltd.; NY

Burney, Ch. (1776-89); *A General History of Music from the Earliest Ages to the Present Period*; London; Ordered 10/17 from alibris (dover 2 volume) London 1776-89 /ND Baden-Baden 1958.

Busoni, F. & Weindel, M. (1907); *Entwurf einer neuen sthetik der Tonkunst.*; Noetzel; Triest 1907, erw. Leipzig 1916.; ISBN: 3795907934

Büchner, A. (1972); *Musikinstrumente von den Anfängen bis zur Gegenwart*

Chambers, W. & R. (1872-73); *Chambers Encyclopedia*; Lippincott;; Philadelphia & Edinburgh

Charleston, R.J. (1984); *English Glass*; George Allen & Unwin; London

Churchill, W (1963); *History of the English Speaking Peoples*; Bantam Books; NY

Churton, T. (2002); *The Golden Builders*; Weiser Books; Boston

Cramer, C. F. (Hrsg.) (1783); *Magazin der Musik*; Hamburg; ND Hildesheim / New York 1971

Duggan, C. (2004); *Concise History of Italy*; Cambridge U. Press; Cambridge

Dörffel, A. (1884); *Geschichte der Gewanhauskonzerte*; Leipzig

Eliade, Mircea (1978); *The Forge and the Crucible*; U. of Chicago Press; Chicago; ISBN: 0226203905

Elville,, E.M. (1961); *Collector's Dictionary of Glass*; Country Life; London

Enzyklopädie des Islam. Geographisches und biographisches Wörterbuch der muhammedanischen Völker. Ergänzungsband. (1938); ; Houtsma, A. et. al. (Hrsg.); Leipzig

Fulcanelli (2005); *Le Mystre des Cath'edrales*; Sworder, M. (tr.); Brotherhood of Life; Las Vegas, NV

Gable, C. (2004); *Murano Magic, Complete Guide to Venetian Glass*; Shiffer; Atglen PA; ISBN: 0764319469

Hammesfahr, J.E. & Stong, C.L. (1968); *Creative Glass Blowing*; Freeman & Co.; San Francisco; ISBN: 0716700883

Harrington, J.C. (1952); *Glassmaking at Jamestown*; Dietz Press; Richmond, VA

Hartshorne, A. (1967); *Antique Drinking Glasses*; Brussel & Brussel; New York

Howard, A.L. (1940); *The Worshipful Company of Glass-Sellers of London*; Glass-Sellers Co.; London

Janesen, E. (1997); *Singing Bowls*; Binkey Kok Publications; Holland

Jarves, Deming (1854); *Reminiscences of Glass-Making*; Eastburn's Press; Boston; Reprinted as Book On Demand through astrologos.com

Kulasiewicz, F. (1974); *Glassblowing*; Watson-Guptill; NY; ISBN: 0273008560

Kurinsky, S. (1991); *The GlassMakers: An Odyssey of the Jews*; Hippocrene Books; NY

Liefkes, R (1997); *Glass*; V & A Publications; London; ISBN: 1851771972

Macfarlane, A. & Martin, G. (2002); *Glass: A World History*; U. of Chicago Press; Chicago

Mentasi, Mollo, Sciaccaluga, ed. (2003); *Glass Throughout Time*; Skira; Milan Italy; ISBN: 8884913454

Moore, N. (1924); *Old Glass, European & American*; Tudor Publishing; NY

Phillips, P. (1981); *Encyclopedia of Glass*; Crown; NY; ISBN: 0517537923

Polak, A. (1975); *Glass: Its Traditions and Its Makers,*; Putnam's Son; NY

Price, W. (1913); *The English Patents of Monopoly*; Harvard U. Press; Cambridge

Savage, G. (1978); *Glass and Glassware*; Octopus Books; Hong Kong; ISBN: 0706401433

Schilling, G. (Hrsg.) (1840); *Encyclopädie der gesammten musikalischen Wissenschaften, oder Universal-Lexikon der Tonkunst.*; Stuttgart

Schubart, Chr. D. F. (1806); *Ideen zu einer sthetik der Tonkunst*; Schubart, L. (Hrsg.); Wien; ND Hildesheim 1969

Spillman, J (1976); *Glassmaking: America's First Industry*; Corning Museum of Glass; Corning, NY

Tait, H. (2004); *Five Thousand Years of Glass*; U. of Pennsylvania Press; Philadelphia; ISBN: 0812218884

Thorpe, W.A. (1935); *English Glass*; Clark Ltd.; Edinburgh

Toso, G. (2002); *Murano, A History of Glass*; Arsenal Editrice; Verona

Walther, J. G. (1732); *Musikalisches Lexicon oder musikalische Bibliothek*; Leipzig; ND Kassel 1953

Wroth, Warwick (1850); *London Pleasure Gardens of the Eighteenth Century*; London

Zerwick, C. (1990); *A Short History of Glass*; Harry Abrams, Inc.; NY

Fiction

Fiction in which the armonica or musical glasses appear.

Byfield, B.N. (1967); *The Glass Harmonica*; Macmillan; NY; In this curious book, the 'glass harmonica' appears in the title but no where else!

Cullin, M. (2003); *A Slight Trick of the Mind*; Doubleday; NY

Geissler, H.W. (1936); *Die Glasharmonika*; Berlin

Goldsmith, O. (1766 / 1986); *The Vicar of Wakefield*; Penguin Books; London

Jean Paul (1795); *Hesperus*

Jean Paul (1803); *Titan*

Jean Paul (1796); *Leben des Quintus Fixlein*

Lawson, R. (1967); *Ben & Me: An Astonishing Life of Benjamin Franklin By His Good Mouse Amos*; Little, Brown & Co.; Boston

Marley, L. (2001); *The Glass Harmonica*; Ace Books; NY

Pynchon, T. (1997); *Mason & Dixon*; Henry Holt & Co.; NY

Stevens, B. (1983); *Ben Franklin's Glass Armonica*; Carolrhoda Books; Minneapolis

Williams, H.L. (1957); *The Singing Glasses*; Arco Publishing; NY

Science

Modern (post-1900) articles about the physics of glass bells

Chan, Y. (2005, Nov.); "Why does water change the pitch of a singing wineglass the way it does?"; *Am. J. Phys.*

Guignard, T. (2002-03 Winter term); *"Tuning of Musical Glasses"*; Swiss Federal Institute of Technology; Zurich

Rossing, T.D. (2001); "Acoustics of percussion instruments; Recent progress"; *Acoust. Sci. & Tech.*

Rossing, T.D. (1984, Oct.); "Vibrational modes of a tuned handbell"; *Journal of the Acoustical Society of America*

Rossing, Th. D. (1994); "Acoustics of the glass harmonica"; *Journal of the Acoustical Society of America*

Rossing, Th. D. (1994, Winter); "Acoustics of the glass harmonica"; *Glass Music World*; Loveland / Colorado

Rossing, Th. D. (2004, May); "Acoustics of the Glass Harmonica"; *Journal of the Acoustical Society of America*

Serafin, S; Wilerson, C; Smith III, J.O. (2002, Sept. 26-28); "Modeling Bowl Resonators Using Circular Waveguide Networks"; *Proc. Of the 5th Int. Conference on Digital Audio Affects (DAFx-02)*; Hamburg, Germany

Historical Music for the Armonica

Solo Works

Frick, Ph. J.: Balletto (frûhestes, bekanntes Werk für Glasharmonika)

Holt Sombach, Joh. J.S. Von: Suite

Mašek, V.V. 11 St”uke und 7 Variationen (ca. 1790-1800)

Mozart, W.A. Adagio C, K617a/K356

M”uller, John. Chr. Verschiedene Stüke in: Anleitung zum Selbstunterricht auf der Harmonika

Naumann, Joh. G Six Sonates pour l'harmonica qui peuvent servir ausi pour le piano forte, 2 Teile (insgesamt 12 Sonaten), Dresden 1786, 1792; hrsg. Von H. Eppstein, Stockholm 1950

Reichardt, Joh. Fr. Grazioso für Glasharmonika (ca. 1786)

Roellig, C. L. Verschiedene St”uke in: Kleine Tonst”ucke f”ur die Liedern f”ur das letztere. Leipzig 1789

Schlett, Joseph 2 Sonaten, M”unchen, 1804

Schmittbauer, J.A. Cinque Préludes et un rondo pour l'armonica ou pianoforte, Wien 1802

Schulz, Joh. A.P. Largo f”ur Harmonika

Tomášek, Joh. W. Fantasie f”ur die Harmonika am Grabe der um dieses Instrument so sehr verdienten Demoiselle Kirchgaessner, Beilage zur AmZ vom 8. März 1809

Chamber Music

Flaschner, G.B. 'Abendlied' und 'An ein Vergissmeinnicht' f”ur Glaharmonika, St.

Holt Sombach, Joh. J.S. Von Adagio f. Glasharmonika und Streichquartett

Mašek, P.L. Benedictus für Glasharmonika, St, Str Divertissment f"ur Glasharmonika, Hf, Hr

Mozart, W. A. Adagio und Rondo f"ur Glasharmonika, Fl, Ob, Va, Vc, KV617

Mozart, W. A. Fragment eines Adagio (Fantasia) (KV Anh.92) f"ur dieselbe Besetzung

Naumann, Joh. G. Duo f"ur Glasharmonika und Laute (nach eine Arie aus Naumans Oper Cor f"ur Gustav III.) Quartett C (Andante-Grazioso) für Glasharmonika, Fl, Va, Vc 1798

Reichardt, Joh. Fr. Rondeau B für Glasharmonika und Streichquintett

Schnyder von Wartensee, Fr. X. Duett für die Harmonika und das Pianoforte (Der durch Music berwundene Wtherich) Allegro furioso-Andante f"ur Harmonika und Kv ca. 1825

Vanhal, J.B. Variationen f"ur Fl"ote und Glasharmonika

Orchestral Works

Berlioz, H. Glasharmonika-Part im Autograph des Satzes Fantaisie sur la Tempête de Shakespeare aus Lélio ou le Retour à la vie 1831/32

Hasse, Joh. A. Kantate L'Armonica f"ur Glasharmonika, Sopran, 2 Ob, 2Hr, Str, Schnbrunn 1769

Reicha, A. Grand solo pour harmonica et l'orchestra. Wien 1806; Abschied der Johanna d'Arc, Melodram nach Schiller f"ur Glasharmonika, Sprecherin, Orch, 12. Mrz 1806

Roellig, C.L. 4 Konzerte für 2 Violinen, 2 Violen, Vc, Fg, 2 Hr, Fl, Harmonika, B, Part, Ms. 18557, 18562, 18564, 18566. Österr. NB, Musikslg.

Saint-Saëns, C. Le Carnaval des animaux. 1922, Glasharmonika in Nr. 7 (Aquarium) und Nr. 14 (Finale)

Weber von, C.M. Adagio e Rondo für Harmonichord für Glasharmonika, Orch. (in Originalpartitur und Briefen ausdrcklich für Glasharmonika bestimmt; letzte Fassung für Harmonichord / Harmonium, 1811, J115)

Opera and Stage Music

Apell, D.A. Von Il trionfo della musica Kantate für Glasharmonika, Sopran, Alt, Tenor, Harfe, zu Ehren Knig Maximilians von Bayern. 1808

Berg, A. Lulu, Pippa-Skizze 28/XV f.2 1928

Beethoven van, L. Melodram f"ur Sprechst, Glasharmonika, Nr. 3 aus Bhnenmsusik zu Fr. Dunckers Drama Leonore Prohaska WoO 96, 1815

Busoni, F. Ursprnglich geplantar Glasharmonika-Part in Fragment der Oper Doktor Faust, Dresden 1925

Davdov, St. I. Glasharmonika-Part in der Oper Rusalka, St. Petersburg 1803

Donizetti, G. Glasharmonika-Part (Wahnsinnsszene) in der Oper Lucia di Lammermoor, Neapel 1835

Glinka, M.I. Glasharmonika-Part in der Oper Rusian und Ljudmila, St. Petersburg 1842

Holliger, H. Schneewittchen. UA: 17.10.1998 am Opernhaus Zurich

Reichardt, Joh. Fr. Der Tod des Herkules (1801) f"ur Glasharmonika, Sprecher; Scena dell'opera Didone abbandonata für Glasharmonika, S, Fl, Ob, Fg,, Hr, Streichquintett; ca. 1799; UA 1784

Roellig C.L. Rezitativ 'Jo Consorte d'Augusto' u. Arie 'Amo te solo' f. Singst, Str u. Harmonika, Ms. 18563, sterr. NB, Musikslg.

Sartie, Giov. Szene aus Didone abbandonata, Kopenhagen 1762: 'Io tradir l'idol mio' für Glasharmonika, S. Fl, Ob, Hr, Str.

Schulz, Joh. A.P. Glasharmonika-Zwischenspiele in Minona oder die Angelsachsen, Tragisches Melodram in 4 Aufzgen, Hamburg 1786

Seidel, Fr. L. Glaharmonika-Klänge zu Grillparzers Trauerspiel Die Ahnfrau, Wien 1817 Stegmann, C.D. Silphen, Gesang mit Glasharmonika, 4 Frauenst. Aus der Feenoper Der Triumph der Liebe oder das khne Abenteuer, Hamburg 1796

Strauss, R. Glasharmonika-Part in Die Frau ohne Schatten, 3. Akt, Wien 1919

Tschaikowski, P.I. Nglichen Orchestrierung des Feenballets Der Nussknacker, St. Petersburg 1892

Noteworthy Works Currently Missing

Bach, C.P.E. Sonate in C (Gh & Vc) / Sonatine in C (Gh, 2 Vlns, Vla, Vc) / Sonate in C (Gh, 2 Vlns, Vc)

Cherubini, L. Sonaten-Solo

Eichhorn, J. Solosonaten und Kammermusikwerke

Goldstein, M Drei Stcke nach Heinrichsen

G"urrlich, J.A. Concertino

Gyrowetz, A. Symphonie f"ur Glasharmonika und Orch.

Hagen van, P.A. Concerto 1793

Mašek, V.V. Soli und Kammermusik mit Glasharmonika, Orchesterstcke Messe in D f. GH, SATB und Streicher

Meterlick, A.J. Grosses Konzert für die Harmonika in G; Variationen für die Harmonika in Es mit Quartett-Begleitung

Moller, J.C. Gh, 2 Tenore, Violoncello 1794

Naumann, J.G. Quartett f. Arm, Fl, Va, Vc.

Nepomuk, D.J. Choral und Fuge

Pleyel, I. Symphonie f"ur Glasharmonika und Orch.

Reicha, A. Fantasien für Marianne Kirchgaessner (Solo) und mit Orch.

Rubenstein, A. Part in Der Dmon, St. Petersburg 1875

Salomen, J. Solosonate

Schneider, C. Andante mit Variationen-Solo

Wanhall, J.B. Neun Variatonen von Wanhalls "uber das Duett 'Nel cor più non mi sento'

Weber, B.A. Monolog aus der Jungfrau von Orlans für Glasharmonika, Sprecherin, 2 Hr. Vc, B; 1801

Correspondence To & From Franklin About the Armonica

Complete, that is, through August 15, 1782: to date, this is as far as the Paper of Benjamin Franklin (PBF), Labaree ed., Yale University) have been completed. Franklin died April 17, 1784. Almost all the letters below are largely concerned with matters other than BF's armonica. The synopses below only summarize that portion of each letter concerned with the armonica.

1762, July 13 (PBF 10: pp. 126 ff): from BF (London) to Beccaria (Italy) [note from PBF 5,395:

Giambatista Beccaria (1716-1781), of the teaching order of Piarists, professor of experimental physics at Turin since 1748, learned about BF's discoveries in June 1752, and by July 2 had drawn electricity from the atmosphere by means of a conductor on his house. His experimentation proceeded so rapidly and successfully that the next year he published Dell'elettricismo artificale e naturale, which contained (pp. 144-8) a letter to Nollet rebutting his attack on BF'S work. Priestley [preeminent scientist of the time] (History of Electricity, London, 167, p. 339) praised his work in the highest terms: "All that was done by the French and English electricians, with respect to lightning and electricy, fell far short of what was done by Signior Beccaria at Turin. A letter of Dec. 24, 1757, is the earliest surviving piece in the BF-Beccaria correspondence."] . BF describes how he came to invent the armonica and describeson how to build and play one:

> Reverend Sir,
>
> I once promised myself the pleasure of seeing you at Turin, but as that is not now likely to happen, being just about returning to my native country, America, I sit down to take leave of you (among others of my European friends that I cannot see) by writing.

I thank you for the honourable mention you have so frequently made of me in your letters to Mr. Collinson and others, for the generous defence you undertook and executed with so much success, of my electrical opinions; and for the valuable present you have made me of your new work, from which I have received great information and pleasure. I wish I could in return entertain you with any thing new of mine on that subject; but I have not lately pursued it. Nor do I know of any one here that is at present much engaged in it.

Perhaps, however, it may be agreeable to you, as you live in a musical country, to have an account of the new instrument lately added here to the great number that charming science was before possessed of: As it is an instrument that seems peculiarly adapted to Italian music, especially that of the soft and plaintive kind, I will endeavour to give you such a description of it, and of the manner of constructing it, that you, or any one of your friends may be enabled to imitate it, if you incline so to do, without being at the expence and trouble of the many experiments I have made in endeavouring to bring it to its present perfection.

You have doubtless heard the sweet tone that is drawn from a drinking-glass, by passing a wet finger round its brim. One Mr. Pockeridge, a gentleman from Ireland, was the first who thought of playing tunes, formed of these tones. He collected a number of glasses of different sizes, fixed near each other on a table, and tuned them by putting into them water, more or less as each note required. The tones were brought out by passing his finger round their brims. He was unfortunately burnt there, with his instrument, in a fire which consumed the house he lived in. Mr. E. Delaval, a most ingenious member of our Royal Society, made one in imitation of it, with a better choice and form of glasses, which was the first I saw or heard. Being charmed by the sweetness of its tones, and the music he produced from it, I wished only to see the glasses disposed in a more convenient form, and brought together in a narrower compass, so as to admit of a greater number of tunes, and all within reach of hand to a person sitting before the instrument, which I accomplished, after various intermediate trials, and less commodious forms, both of glasses and construction, in the following manner.

The glasses are blown as near as possible in the form of hemispheres, having each an open neck or socket in the middle. The thickness of the glass near the brim about a tenth of an inch, or hardly quite so much, but thicker as it comes nearer the neck, which in the largest glasses is about an inch deep, and an inch and half wide within, these dimensions lessening as the glasses themselves diminish in size, except that the neck of the smallest ought not to be shorter than half an inch. The largest glass is nine inches diameter, and the smallest three inches. Between these there are twenty-three different sizes, differing from each other a quarter of an inch in diameter. To make a single instrument there should be at least six glasses blown of each size; and out of this number one may probably pick 37 glasses, (which are sufficient for three octaves with all the semitones) that will be each either the note one wants or a little sharper than that note, and all fitting so well into each other as to taper pretty regularly from the largest to the smallest. It is true there are not 37 sizes, but it often happens that two of the same size differ a note or half note in tone, by reason of a difference in thickness, and these may be placed one in the other without sensibly hurting the regularity of the taper form.

The glasses being chosen and every one marked with a diamond the note you intend it for, they are to be tuned by diminishing the thickness of those that are too sharp. This is done by grinding them around the neck towards the brim, the breadth of one or two inches, as may be required; often trying the glass by a well-tuned harpsichord, comparing the tone drawn from the glass by your finger, with the note you want, as sounded by that string of the harpsichord. When you come near the matter, be careful to wipe the glass clean and dry before each trial, because the tone is something flatter when the glass is wet, than it will be when dry; and grinding a very little between each trial, you will thereby tune to great exactness. The more care is necessary in this, because if you go below your required tone, there is no sharpening it again but by grinding somewhat off the brim which will afterward require polishing, and thus increase the trouble.

The glasses being thus tuned, you are to be provided with a case for them, and a spindle on which they are to be fixed. My case is about three feet long, eleven inches every way wide within at the biggest end, and five inches at the smallest end; for it tapers all the way, to adapt it better to the conical figure of the set of glasses. This case opens in the middle of its height, and the upper part turns up by hinges fixed behind. The spindle which is of hard iron, lies horizontally from end to end of the box within, exactly in the middle, and is made to turn on brass gudgeons at each end. It is round, an inch diameter at the thickest end, and tapering to a quarter of an inch at the smallest . A square shank comes from its thickest end through the box, on which shank a wheel is fixed by a screw. This wheel serves as a fly to make the motion equable, when the spindle, with the glasses, is turned by the foot like a spinning wheel. My wheel is of mahogany, 18 inches diameter, and pretty thick, so as to conceal near its circumference about 25 lb of lead. An ivory pin is fixed in the face of this wheel, and about 4 inches from the axis. Over the neck of this pin is put the loop of the string which comes up from the moveable step to give it motion. The case stands on a neat frame with four legs. To fix the glasses on the spindle, a cork is first to be fitted in each neck pretty tight, and projecting a little without the neck, that the neck of one may not touch the inside of another when put together, for that would make a jarring. These corks are to be perforated with holes of different diameters, so as to suit that part of the spindle on which they are to be fixed. When a glass is put on, by holding it stiffly between both hands, while another turns the spindle, it may be gradually brought to its place. But care must be taken that the hole be not too small, lest, in forcing it up the neck should split; not too large, lest the glass, not being firmly fixed, should turn or move on the the spindle so as to touch and jar against its neighboring glass. The glasses thus placed one in another, the largest on the biggest end of the spindle which is to the left hand; the neck of this glass is towards the wheel, and the next goes into it in the same position, only about an inch of its brim appearing beyond the brim of the first; thus proceeding, every glass when fixed shows about an inch of its brim (or three quarters of an inch, or half an inch, as they grow smaller) beyond the brim of the glass that contains it; and it is from these exposed parts of each glass that the tone is drawn, by laying a finger upon one of them as the spindle and glasses turn around. My largest glass is G, a little below reach of a common voice, and my highest G, including three compleat octaves. To distinguish the glasses the more readily to the eye, I have painted the apparent parts of the glasses within side , every semitone white, and the other notes of the octave with the seven prismatic colours, viz. C, red; D, orange; E, yellow; F, green; G, blue; A, indigo; B, purple; and C, red again; so that glasses of the same colour (the white excepted) are always octaves to each other.

This instrument is played upon, by sitting before the middle of the set of glasses as before the keys of a harpsichord, turning them with the foot, and wetting them now and then with a sponge and clean water. The fingers should be first a little soaked in water, and quite free from all greasiness; a little fine chalk upon them is sometimes useful, to make them catch the glass and bring out the tone more readily. Both hands are used, by which means different parts are played together. Observe, that the tones are best drawn out when the glasses turn from the ends of the fingers, not when they turn to them.

The advantages of this instrument are, that its tones are incomparably sweet beyond those of any other; that they may be swelled and softened at pleasure by stronger or weaker pressures of the finger, and continued to any length; and that the instrument, being once well tuned, never again wants tuning.

In honour of your musical language, I have borrowed from it the name of the instrument, calling it the Armonica.

With great esteem and respect, I am, Etc.

[Signature ???] B. Franklin

1762, December 7 (PBF 10: p. 169): from BF (Philadelphia) to William Strahan (London). BF inquires about Mr. Johnson having his armonica repaired, and the progress of his daughter Rachel Johnson in playing it.

1762, December (PBF 10: p. 180-182): from BF (Philadelphia) to Hughes and Co (London): Directions for making a glass armonica

1762 (PBF 10: p.185): from [Grey] Cooper to BF (Philadelphia): Request that BF play his armonica for Mr. Cooper and friends.

1763, March 2 (PBF 10: p. 205): from BF (Philadelphia) to Cadwallader Colden: remarks in passing about inventing a 'new musical instrument':

> While in England, after my chief Business was over, I amus'd myself, with contriving and bringing to a considerable Degree of Perfection, a new musical Instrument, which has afforded me and my Friends a great deal of Pleasure; but the Description of it would make this Letter, already too long, much longer.

1763, March 25 (PBF 10: p.235): from BF (Philadelphia) to Mary Stevenson (London); BF's remarks about difficulties in having armonicas made:

> I am vex'd with Mr. James that he has been so dilatory in Mr. Maddison's Armonica. I was unlucky in both the Workmen that I permitted to undertake making thos Instruments. The first was fanciful, and never could work to the purpose, because he was ever conceiving some new Improvement that answer'd no End: the other, I doubt, is absolutely idle. I have recommended a Number to him from hence, but most stop my hand.

1763, November 28 (PBF 10: pp.383 ff): from BF (Philadelphia) to Jonathan Williams (Boston); 'the Armonica arrived safe, not a Glass hurt'...

1764, April 24 (PBF 11: p. 178-179): from BF (Philadelphia) to Jonathan Williams (Boston); 'It grieves me that the Glasses are not yet come for the Armonica.'

1764, September 1 (PBF 11: p.333): from BF (Philadelphia) to William Strahan (London): Remarks that his daughter Rachel Johnson has probably been distracted from playing the armonica by her new baby:

> I want to hear Rachey upon the Armonica; but her Attention is probably withdrawn from that, by her new Plaything, the Baby, which furnishes more agreable Musick.

1764, November 3 (PBF 11: p.426-427) from BF (Philadelphia) to Jonathan Williams. BF had apparently undertaken to have an armonica made for Williams' son, Josiah, a blind young man with musical aspirations. In this letter BF notes that the case and spindle have been completed (in Philadelphia), but decides it would be better to have a complete instrument made in London. 1764, November 6 (PBF 11: p.446) from Benjamin Humphreys to BF, a bill for two "steel spendels for the armonica".

1765, Feb. 14 (PBF 12: p.64) BF (London) to Deborah Franklin (Philadelphia): "Let Sally divert you with her Music. Put her on Practising on the Armonica."

1765, Oct. 6-13? (PBF 12: p.294) from Deborah Franklin (Philadelphia) to BF (London): the armonica in their new house:

> [T]he Blewroom [the "Blue Room", the music room] has the Armoneyca and the Harpseycord in it the Gilte Sconse a Carde tabel a seet of tee Chaney [china] I bought sens you wente from home the worked Chairs and Screen a verey hansom mohoganey Stand for the tee kittel to stand on and the orney mental Chaney but the room is not as yit finished for I think the paper has loste much of the blume by paisteing of it up thair-fore I thought beste to leve it tell you Cume home[.]

1766, April 28 (PBF 13: p.253) from BF (London) to Jonathan Williams (Boston): BF still unable to obtain an armonica for Cousin Josiah. ". . . I did not forget the Armonica, for Cousin Josiah. but with all my Endeavours I have not yet been able to procure one. Here is only one Man that makes them well, his Price no less than 34 Guineas, asks 40."

1766-9 (PBF 13: 548) From [Mary] Rich: she is having so much difficulty keeping the glasses turning properly that she proposes a handle to be turned by another person while she plays. 1767, June-August (PBF 14: p.204) from Mary Rich (Grosvenor Square, London) to BF (London): she wants instruction from BF about the armonica—'some Little Idea of the practice of it'. . . She has just heard that Miss Davies has been performing with great applause.

1767, July 6 (PBF 14: p. 210-11) from BF (London) to Rudolph Erich Raspe (Hanover):

> I shall be glad to see Professor Meister's Account of my Armonica. I wish your Artist may succeed in making the Armonica. Mr. Professor Gatzert has heard that Instrument plaid upon here by an excellent Hand, and can give you some Account of the great Sweetness of its Tones, and the fine Harmony it produces.

1769, January 5 (PBF 16: p.8) from BF (London) to Michael Hillegas (Philadelphia): BF assures him a shipment of armonica glasses that arrived broken will be remedied.

1769, April 15 (PBF 16: p.111) from Michael Hillegas (Philadelphia) to BF (London): hopes the next set of armonica glasses 'will meet a better fate than the others you were pleased to send.'

1769, November 25 (PBF 16: p.236) from Michael Hillegas (Philadelphia) to BF (London): still hasn't received the armonica glasses.

> Before I conclude Permitt me of reminding you of my old troublesome Commission, to wit, the Glasses for my Armonica beg you'll send them under particular care if Possible per Capt. N. Falconer.

1771, May 20 (PBF 18: p. 109-110) Beccaria's reply.

1772, Jan 17 (PBF 19: 38) From William Outram, Merchant Captain, to BF (Philadelphia), commissioned to purchase and ship a good armonica.

1772, Sept. 28 (PBF 19: 305) From the Count of Belgioso (London) to BF (London): wants to know where to obtain an armonica for the French Ambassador.

1772, Dec. 10 (PBF 19: 422) From BF (London) to Jacques Barbeu-Dubourg. BF amplifies what he wrote to Becarria a decade earlier.

1775, May 20 (PBF 22:49) From Jonathan Williams Jr. (London) to BF (London): La Duchesse de Villroy's plans for a keyboard armonica are on their way. (Alas, those plans have disappeared.) 1775, June 7 (PBF 22:61) From Jonathan Williams Jr. (London) to BF (London): The Infanta of Spain is "exceedingly pleased" with his repaired armonica.

1778, Jan. 29 (PBF 25:543) From Cecilia Davies (Paris) to BF (Paris). Cecilia's sister Marianne first premiered Franklin's invention in Jan. 1762; Cecilia (soprano) and Marianne (armonica) together performed throughout England and the European continent:

> Sir:
>
> I hope you will Excuse the liberty I take in troubling you with this line but being come to Paris with my Mother and Sister on account of the latter's health, should think myself guilty of an unpardonable negelct were I not to take an opportunity of waiting on the ingenious Inventor of the Divine Armonica. My Sister continually expresses her infinite Obligations to You Sir, and as She is just at present able to go out is extremely desirous to have the pleasure of seeing you; but least we might happen to call at an inconvenient time I should Esteem it a particular favour could you let me know by the Bearer [of this letter] any moment tomorrow when you are at leisure, as we are very impatient to have the happiness of waiting on you. If not tomorrow, any other Day Except Saturday or Monday next. . .

1778, Jan. 30 (PBF 25:550) From Cecilia Davies (Paris) to BF (Paris). BF's prompt response to the previous note was a dinner invitation, to which she responded:

> I should have been happy to the greatest degree in the honour of Dining with you Sunday, but to my misfortune since my Sister's late Illness she does not Dine from home; but I shall have the honour of waiting on you with my Mother and Sister Sunday afternoon if you will give us leave.

1778, Sept. 24 (PBF 27:456) From Cecilia Davies (Paris) to BF (Paris). Cecilia thanks BF for his letter and the opportunity of another meeting.

1778, Oct. 5 (PGF 27:506) From Jan Ingenhouz (London) to BF (Passi, France): Mentions that Mesmer is in Paris. [No mention of the armonica per se, but Mesmer looms large in the history of the armonica.)

1778, Dec. 10 (?) (PBF 28:215) From BF (Passi) to Madame Brillon (Passi): A fantasy of 'paradise', in which BF will be playing the amonica: I'll have the time "to practice the armonica, and perhaps I will play well enough that you will kindly let me accompany your piano-forte."

1779, Nov. 1 (PBF 31:5) From F.A. Mesmer, to BF

> I will have the honor to receive you with the biggest Empressment thus qu Madam of Brilon, the day than you indicated. I Regretterai of not to be able to give to this lady the whole Satisfaction that she desire, my harmonica not at all having brought up and not being able to be it of here to this tms.[???]
>
> I will be flattered if I can put you to mme of reconnoitre the Reality and the usefulness of my decouverte and you to give proofs of the deep Respect with which I Am, of Your Excellence, The very humble and very obissant Servant,[1] MESMER

1779, Nov. 1 (PBF 31:8) From M. Brillon to BF: In Paradise "Mr. Mesmer will be content to play the armonica, without boring us with 'Electric Fluid'."

1779[?] (PBF 31:311ff) 1779 is a best guess as to when BF wrote these instructions. It is equally unclear to whom he wrote them.

> Some Directions for the Drawing out the Tone from the Glasses of the Armonica
>
> The Glasses must be always kept perfectly clean from the least Greasiness; therefore suffer no body to touch them with

[1] J'aurai l'honneur de vous recevoir avec le plus grand Empressment ainsi qu Madame de Brillon, le jour que vous indiqués. Je Regretterai de ne pouvoir donner à cette dame toute la Satisfaction qu'elle desire, mon harmonica n'étant point monté et ne pouvant l'être d'ici à ce têms.

Je Serai flatté si je peux vous mettre mme de reconnoitre la Réalité et l'utilité de ma decouverte et vous donner des preuves du profond Respect avec lequel je Suis, de Votre Excellence, Le très humble et très obèissant Serviteur, unwash'd Hands; for even the common slight natural Greasiness of the Skin rubb'd on them will prevent their Sounding for a long time. You must be provided with a Bottle of Rain Water (Spring Water is generally too hard and produces a harsh Tone) and a middling Spunge in a little Slop Bowl, in which you must keep so much of the Water, that the Spunge may be always very wet.

In a Tea Cup keep also ready some fine scrap'd Chalk, free from Grit, to be us'd on Occasion. Before you sit down to play, the Fingers should be well wash'd with Soap and Water, and the Soap well rins'd off. The Fingers when you begin to play,

not only be wet on the Surface, but the Skin a little soak'd, which is readily done by pressing them hard a few Times in the Spunge. The first Thing after setting the Glasses in Motion, is to pass the Spunge slowly along from the biggest Glass to the smallest, suffering it to rest on each Glass during at least one Revolution of the Glasses, whereby they will all be made moderately wet. If too much Water is left on them they will not sound so readily- If the Instrument is near a Window let the Window be shut, or the Curtain drawn, as Wind or Sunshine on the Glasses dries them too fast.

When these Particulars are all attended to & the Directions observ'd, the Tone comes forth finely with the slightest Pressure of the Fingers imaginable, and you swell it at pleasure by adding a little more Pressure, no Instrument affording more Shades, if one may so speak, of the Forte & Piano.

One Wetting with the Spunge will serve for a Piece of Music twice as long as Handel's Water pice, unless the Air be uncommonly drying—

But a number of thin Slices of Spunge plac'd side by side, and their Ends held fast between two Strips of Wood like Rulers, of a length equal to the Glasses, and plac'd so that the loose Ends of the Spunges may touch the Glasses behind, and by that means keep them constantly wet, is very convenient where one proposes to play a long time. The Spunges

> being properly wetted, will supply the Glasses sufficiently a whole Evening, and touching the Glasses lightly do not in the least hurt the Sound—
>
> The Powder of Chalk is useful two Ways.
>
> The Fingers after much Playing sometimes begin to draw out a Tone less smooth and soft, and you feel as well as hear a small Degree of Harshness. In that Case, if you dip the Ends of your wet fingers in the Chalk so as to take up a little, and rub the same well on the Skin, it will immediately recover the smoothness of Tone desired.
>
> And if the Glasses have been sullied by Handling, or the Fingers not being just wash'd have some little Greasiness on them, so that the Sounds can easily be produc'd, Chalk so us'd, will clean both Glasses & Fingers, and the Sounds will come out to your Wish.
>
> A little Practice will make all this familiar, and you will also find by Trials, what Part of the Fingers most readily produces the Sound from particular Glasses, and whether they require to be touch'd on the Edge chiefly, or a little more on the Side, as different Glasses require a different Touch, some pretty full on the flat Side of the Brim to bring out the best Tone, others more on the Edge, and some of the largest may need the Touch of Two Fingers at once.

1780, Dec. 10 (PBF 34:145) From BF to M. Brillon (Passi) "Mr. Pagin did me the honor of visiting me yesterday. He is undoubtedly one of the best possible men; because he had patience to hear me play an Air on the Harmonica & to hear it until the end."

1781, Nov. 19 (PBF 36:73ff) By extraordinary chance Elkanah Watson, the 23-year-old merchant and avid diarist, dined at Passy on the evening that Franklin would receive at midnight—after playing his armonica for him earlier in the evening—the following letter announcing the American/French victory at Yorktown [which effectively ended the American Revolution]:

> On [November] 19th. I dined and spent the evening with Franklin, at Passy; arriving at an early hour, I observed

him in a distant room reading, in the exact position9 he is represented in an excellent engraving, his left arm resting on a table, and his chin on his right hand thumb.1 I was soon conducted to him, and was cordially received, as usual. From a long habit of mixing with courtiers and men of eminence, as well in America as in Europe, he possesses an urbanity of manners, in connection with his venerable locks suspended over his shoulders, and his personal dignity, which commands reverence and respect; and yet so natural and fascinating in his deportment, that I always find myself perfectly at ease in his presence. Although he loves adulation, he woos it and hugs it to his heart in a manner unperceived, and therefore diminishes naught from his sterling merit. Not so with the vain boaster, trumpeting his own fame above all the fraudulent men who float upon borrowed plumes. Such men are always detected; soon sink into contempt, and hold a short run with posterity. But the name of Franklin will freshen with posterity, and increase in fame, through a long line of generations, while America shall bear a name. To resume- after detailing the traitorous conversation of Silas Dean at Brussels, where he vegetates, and is buried in forgetfulness and contempt; he asked me if I knew he was a musician, and then conducted me across the room to an instrument of his own invention, fixed as a harpsichord. On my intimating a wish to see him perform, he immediately placed himself before it with his habitual condescension, touching the ends of his fingers on a moistened piece of sponge, and commenced playing with his right foot, bearing upon a treadel fixed in the manner of a spinning wheel, which turned a set of musical glasses, presenting their edges in perpendicular positions, in the shape of saucers graduated of different sizes, so as to produce all the requisite tones. He touched the edges with the ends of his fingers, playing a Scottish pastoral tune, in sweet delicate melody, which thrilled me to my very soul.- Besides, the novel spectacle was highly gratifying to my high toned American pride, to contemplate a native son of my native state, a distinguished philosopher in his 76th year, exhibiting on an instrument of his own invention, which he has named Harmonica. In the evening we were joined by the celebrated Dr. Bankroft, also a native of Massachusetts; a distinguished chemist and politician; a sound whig, although a resident in London. It is supposed he is an agent sub rosa of the British ministry, feeling out the road to peace.

Our conversation turned principally on the interesting subject of the grand military combination of America and France to subdue the army of Cornwallis, in Virginia. Our last information up to that evening was, that de Grasse had entered the Chesapeake with 24 sail of the line; that Washington's and Rochambeau's armies had united, and were pressing towards Virginia; that de Barras with seven sail of the line had left Rhode Island, to unite with de Grasse.2 That the British fleet of about 23 Sail of the line had left New York with an army of 10,000 Men on their way to the Chesapeak. That a reinforcement of Ships were on their way from England, and shou'd they have arriv'd in time cou'd place the respective fleets on a ballance but de Grass was in possession of the ground between the British Army & Navy. In this interesting Crisis on which the fate of a young empire was in some measure depending-and where so many chances being suspended in dreaded poize; an anxiety was excessive, & our hopes & fears in quick succession predominated. We weighed probabilities-balanc'd vicissitudes-dissected the best Maps; and finally it resulted in a disheartening foreboding, that the English Fleet wou'd intercept de Barras at the Capes of the Chesapeak and thus gain a superiority, and with their [vaunt?]ed bravery urg'd by dispair dash into the Bay- close with, & distroy the French Fleet-Land their Army & brake up Washington's quarters. Thus our unhappy Country would again bleed at every vein- & the war commence de nouvo with fresh vigor on the part of our implacable enemy. As Franklin's great influence at the Court of France was the primary cause of producing this bold enterprize; it can be easily concieved how strong must have been his excitements in our alternate views of probable results.

At times his Philosophy seem'd to abandon him in gloomy despondency-& then viewing the issue in an opposite light, his hopes wou'd flash into a concertion of compleat success. Altho' in his 76th year, yet his whole machinery appeared in a state of elasticity, and in active play- So much was he exhilerated when hope predominated. At 11 o'C I return'd to Paris in gloomy despondency, sighing over the distresses of my bleeding Country, & soon retired. At the dawn the insuing morning a tremendous rapping at my door arrouz'd me from a restless slumber. But gracious GOD how was I delighted & astonish'd in recieving the following circular under cover from Dr. Franklin with his congratulations. The circular was in french, copied by a copying Machine in English thus- the machine he informs me was invented by the ingenious Mr. Watt of Birmingham

"Copy of a letter from the Comte de Vergennes, Prime Minister of France, to Mr. Franklin, dated Versailles, 19th Novr., 1781, 11 o'C at night. (Note, dated the precise moment I Left Franklin's house- and exactly one month from the day of surrender-)

> 'Sir:
>
> I cannot better express my gratitude for the news you often communicate to me, than in making you acquainted that the Duke of Lauzan arrived this afternoon with the agreable News that the Combin'd Armies of France & America have forced General Cornwalis to capitulate. The English Garrison came out from York Town the 19th Octr. with honors of war, & laid down their arms as Prisoners.
>
> 'About 6000 troops, 1800 Sailors 22 Stand of Colours and 170 pieces of Canon 75 of which are brass are the trophies which signalize this Victory. Besides a Ship of 50 guns which was burnt, also a Frigate & a great Number of transports.
>
> 'J'ai l'honneur d'etre &c. &c. DE VERGENNES'

The same day I waited on his Excellency with many American & French to Offer our congratulations. He appeared in an ecstacy of Joy, observing, "there is no parallel in history of two entire armies being captured from the same enemy in any one war." The American character now rose to an enviable height-the joy of all classes of people was excessive. Paris was brilliantly illuminated three successive nights on this glorious occasion-which settles our controversy definitively with England. On my return to Nantes I found all the Cities in my rout in a blaze of illumination; & Nantes in the midst of it, on my arrival.

1782, July 25 (PBF 37:676-7) From Faesh to BF (Philadelphia ???): [originally in French]

> Sir:
>
> I heard at Mr. Charles, Demonstrator of Physics [Jacques-Alexandre-Csar Charles (1746-1823), once a petty functionary in the finance bureau, was inspired by reading BF's work to learn the elements of experimental physics and in 1781 began offering a public course of lectures. His eloquence and the precision of his experimental demonstrations attracted a wide audience, including members of the Academy of Sciences and BF himself on at least one occasion.], an armonica, belonging to Sr. Hulmandel, Professor of Music, who assured me that is was your Invention; I was enchanted and I die of desire to have my own; but despite all my research, I can not get one; would you the supplier kindly indicate the means of possessing of a musical instrument like it, more delightful than any I know in the world? I would be infinitely obliged to you.[1]

— As of date of publication, PBF has not published the remaining volumes of Franklin's papers, although a few more letters concern the armonica:

1783, April 26 From Marianne Davies (Florence) to BF (Paris). Marianne Davies, who was the first to perform on Franklin's armonica and toured Great Britain and Europe performing on it, finds herself and her sister in desperate circumstances and appeals to Franklin for help.

1783, October 17 From Marianne Davies (Florence) to BF (Paris). She

[1] ??? NEED FRENCH

hasn't received a reply from her letter to Franklin of April 26, 1783, and wonders if he received it.

1784, July 1. From the Count de Saluces (Turin) to BF (Passy). Announces that L'abbé Perno has successfully applied a keyboard to the armonica.

1785, July 5 From BF (Passy) to the Count de Saluces (Turin). Franklin wants to know more about the keyboard armonica.

Correspondence To & From Thomas Jefferson About the Armonica

1786, June 28 from Francis Hopkinson (Philadelphia) to TJ:

> My spare Time and Attention is at present much engaged in a Project to make the Harmonica or musical Glasses to be played with Kees [keys], like an Organ. I am now far forward in this Scheme and have little Doubt of Success. It has in vain been attempted in France and England. It may therefore seem too adventurous in me to undertake it, but the Door of Experiment is open; in Case of Disappointment the Projector is the only Sufferer.

1787, Feb. 12 from TJ (Paris) to Charles Burney:

> A friend of mine in America (the same who improved the quilling of the harpsichord) writes me word he is succeeding in some improvements he had proposed for the Harmonica. However imperfect this instrument is for the general mass of musical compositions, yet for those of a certain character it is delicious.

1787, Oct. 11 from TJ (Paris) to John Trumbull:

> Mr. Cutting has for some days been in possession of a letter for you, but finding his departure put off from day to day, I take the liberty of repeating by post a request which is in that letter. It is to enquire whether the ship James (Capt. Dunn) with my harpsichord is actually sailed from London.

> The appearances of an immediate rupture between the two nations[???] make me anxious that is should arrive here as immediately as possible. I will also be obliged to you to enquire the price of a good harmonica, the glasses fixed on an axis, to comprehend 6 octaves, if they ever comprehend as much, in a plain mahogany case.

1787, Oct. 30 from John Trumbell (London) to TJ:

> I have received your two letters of the 4th. By Mr. Cutting and the 11th. By post, and have made the enquiry you request with respect to the sailing of Capt. Dunn with your instruments. He certainly left shi port at least four weeks ago I am told the Harmonica is never made to exceed three octaves. For one of that kind Longman & Brodsip ask me thirty guineas. I will enquire further on this subject.