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The invention of the fortepiano as intellectual history

In memoriam Sibyl Marcuse (1911–2003)

FROM the vantage point of the 21st century the piano can be viewed as the most popular musical instrument of all time. Within the microcosm of Italian history, however, the Cristofori fortepiano was all but stillborn. More than 30 years passed before any music for the instrument was published. Why was the instrument so ignored on its native soil? Why was its sound not found captivating? Why was its improved dynamic control not appreciated by a broad public?¹

The answers that have been advanced emphasize organological and historical factors, but little mention is made of the immediate Italian intellectual context with which the instrument can be associated. Social histories of music enable us to see that, in general, musicians of the time occupied a relatively low socio-economic status. Instrumentalists around 1700 were often provided with room and board but little by way of payment. Yet the musicians for whom Cristofori's instruments were built were predominantly noblemen, among whom there was a fervent desire to acquire proficiency in playing instruments. (The modern pejorative implications of the term 'amateur' did not exist.) Many were also composers. Among composers who styled themselves dilettantes were the brothers Benedetto and Alessandro Marcello, about whom more will be said later. Noblemen who pursued a range of interests in the arts (drawing, painting, playing instruments, writing poetry and sometimes plays, translating ancient works, and of course reading) could focus the same wide-eyed gaze on matters scientific and technical. There was a social institution

in which all of these interests converged—the learned assembly that convened weekly in most Italian cities. Multiple academies coexisted in many places. Confusingly, these gatherings were called *accademie*, even though they were virtual organizations rather than physical locations.

The Arcadian colony that was established in Rome in 1691 was devoted to promoting the values of ancient Greece (it had parallels in later times in Germany). Most of the focus was on literature, especially drama and poetry. The Arcadians invoked the 'purity' of ancient Greece by meeting in pastoral settings (weather permitting—they met indoors in the winter) and promoting pastoral ideas in many of their own creative works. Unlike the Florentine Camerata of a century before, their interests reached into many spheres of life. They met regularly during certain times of year, and new works were presented and discussed at every meeting. Their programmes could intersperse musical performances with poetry readings and debates. It is undoubtedly the case that a 'collector's mentality' was in course of formation. Assembled noblemen were eager to display their gathered antiquities as well as their inventions, for knowledge of the past was viewed as a stimulus to shaping the future. What differentiated the Arcadians from other academicians was that they rapidly formed a league of colonies. It produced, among others of great accomplishment, the Venetian dramatist and journalist Apostolo Zeno and a host of poets in other Italian cities.

The rise of amateur music-making and the formation of collections of musical instruments in parallel with the peak years of Arcadianism were pronounced

phenomena. Reports of orchestras of a hundred strong are prolific in period sources from Rome and Venice. Although most scholars take these reports to be exaggerated, some Venetian documents indicate that orchestras for private concerts in palaces swelled as noblemen joined the ranks of professional musicians with their own string instruments.²

When the first publication of sonatas for the new instrument appeared in 1732, it was dedicated by a Brazilian priest, Don Joan [Giovanni] de Seixas,³ to the Portuguese prince Don Antonio, son of King Joan V. It would be difficult to place the composer, Lodovico Giustini, within this Brazilian-Portuguese narrative were it not that Cristofori in his later years seems to have enjoyed the patronage of King Joan. Cristofori provided at least one fortepiano to the court in Lisbon while Scarlatti was resident there.⁴ Although such evidence of his activity has been duly gathered, we possess relatively few basic facts about Cristofori's life.⁵ Born and raised near Padua, he joined the court as keeper of the Medici instrument collection in 1688. He was well known for his *gravicembali*, some of which were quite unusual, but it was his construction of 30 or more fortepianos (Sutherland's estimate) for which he is best remembered.⁶ Like the court musicians whom he served, he was extremely dependent on the whims and fortunes of the Medici household itself. Blessed with a long life (1655–1732), Cristofori must have witnessed the progressive physical decline of his principal patron, Prince Ferdinando (1663–1713).⁷ Ferdinand's brother, the Grand Duke Gian Gastone, was to die without descendants five years after Cristofori himself, in 1737 and thus to bring Medici rule to an end.

It was probably the death of Cristofori in January 1732 that occasioned the printing of Giustini's collection of 12 sonatas (the *Sonate da cimbalò di*

piano e forte detto volgarmente di martelletti).⁸ The works may have been composed over many preceding years, but Giustini had failed to find the means to publish them before the arrival of Seixas. The sonatas themselves give us relatively slight evidence of the instrument's capabilities as understood by Giustini, but since they are the only surviving works that can be associated with Cristofori's own instruments, they bear close inspection. Their predominantly French textures would have suited the cultural persuasion of the Medici court in its final years. Among the clues to novelty of sound are the following musical features:

- 1 New degrees of subtlety in dynamic shading. For example, the dynamic level can be uncoupled from the number of notes being sounded simultaneously (ex.1).
- 2 Bass notes sustained long enough to provide support beneath a more rapidly moving treble (ex.2).
- 3 Treble foreground notes that can be played with enough relative loudness to make *cantabile* melodies stand out from the background accompaniment (ex.3). (A common way to give the impression of increased loudness on the harpsichord was to add notes to chords or cadential passages, but the particular patterning shown in ex.3 precludes such a practice. In ex.1 the indication for chords marked 'pia[n]', followed by fuller chords marked 'più pia[n]' defies the same performance convention.)
- 4 Indications for detachment of individual notes ('), a practice that contributes to foreground-background differentiation, and suggests some control over decay times (ex.4).

It can also be seen that features popular in the harpsichord repertory are not compromised by

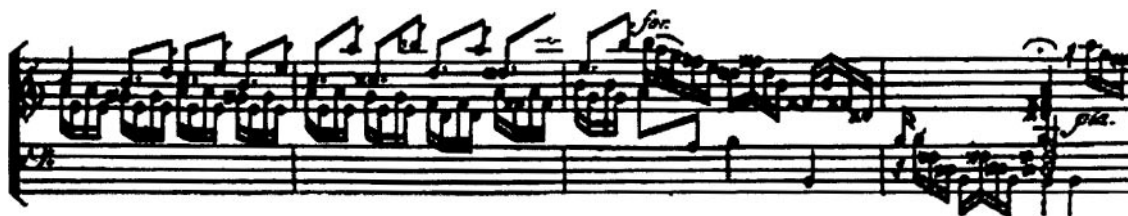
Ex.1 Lodovico Giustini, Sonata no.7, from *Sonate da cimbalò di piano e forte*, op.1 (Florence, 1732), Corrente, bars 61–5.



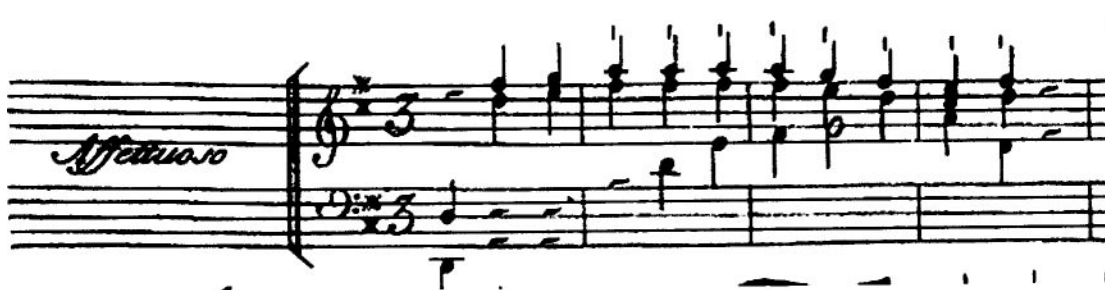
Ex.2 Lodovico Giustini, Sonata no.5, from *Sonate da cimbalo di piano e forte*, op.1 (Florence, 1732), Adagio e arpeggiato nell' acciaccature, bars 1–4.



Ex.3 Lodovico Giustini, Sonata no.9, from *Sonate da cimbalo di piano e forte*, op.1 (Florence, 1732), Allemanda, bars 26–9.



Ex.4 Lodovico Giustini, Sonata no.5, from *Sonate da cimbalo di piano e forte*, op.1 (Florence, 1732), Affettuoso, bars 1–4.



the new fortepiano mechanism. For example, the ubiquitous ornamentation of French harpsichord music and the arpeggiation common to Italian string and keyboard works of the time can easily be accommodated.

Scientific enquiry in 17th-century Italy

The apparent indifference of rank-and-file musicians to the invention of the fortepiano may well be because it was principally identified as an invention of *scientific* rather than *artistic* importance. To all but those most closely associated with its actual construction, the fortepiano was in the first instance an

invention for its own sake. There was no practical mandate for its use. Rather, its progressive development in a stream of one-of-a-kind models over Cristofori's lifetime parallels the development of scientific and mechanical *conversazioni* (academic gatherings) in Italy, particularly under the patronage of the Medici. From Galileo's invention of the telescope in 1610, the 17th century was rich in technological innovations that were in constant dialogue with rapidly evolving theories of light, sound, colour, waves and other phenomena of nature. To minds formed at the end of the Renaissance, all knowledge was linked. Inventions did not exclusively

belong, as they might today, to a particular science or art.

Italian intellectuals were particularly interested in instruments of measurement. Compasses, astrolabes and globes had been compelling interests of the Medici family in Florence since the 16th century. It was in Padua that Galileo invented the telescope. Finding the Venetian Senate indifferent to his discoveries, Galileo resigned his position at the University of Padua to become court astronomer of the Medicis with the official title of ‘Philosopher and Mathematician’.⁹

Florence became the acknowledged home to many inventions of lasting value, among them the first microscope (1620), the thermometer (to which Galileo also laid claim)¹⁰ and the barometer (by Evangelista Torricelli, 1643). What prompted the experimental mentality of the Florentines was an interest in evaluating the untested but long revered ‘natural philosophy’ of Aristotle. In 1657, 15 years after Galileo’s death, Prince Leopold de’ Medici formed the Accademia del Cimento (illus.1) to include many of the late astronomer’s pupils.¹¹ The Academy lasted for only ten years (1657–67), but the stimulus given by the Medici household to the quest for discovery and control of natural phenomena took on a life of its own.

Musical interests were not particularly differentiated from other scientific interests, either in Florence or in Europe at large. Galileo’s father, Vincenzo, was a noted music theorist, lutenist and proponent of monody. He championed its quasi-Aristotelian union of poetry and music. Following Zarlino’s theories, Galileo’s contemporary Johannes Kepler (*Harmonices mundi*, 1618) believed that geometrical theorems could explain relationships between the seven planets and the seven scales (illus.2).

The annals of music theory from all over Europe between 1550 and 1750 abound with major writings by scientists who also influenced musical thought. Examples includes Marin Mersenne’s *Harmonie universelle* (1636–7) and Athanasius Kircher’s more acoustically oriented *Phonurgia nova* (1673). All this research remained academic, however, with little thought for any immediate benefit to the ordinary man or woman.



1 A meeting of the Accademia del Cimento (1657).



2 Johannes Kepler’s notation for the scale of the planet Mercury.

One event that refocused widespread general interest in measurement was the publication in 1687 of Isaac Newton’s treatise on mechanics, the *Principia mathematica*. Newton (who was born in 1642,

the year of Galileo's death) was particularly preoccupied with questions of force and motion and the relationships between them. Newton's second law—that, for any given body, the acceleration produced is proportional to the strength of the external force—is directly demonstrated by the key mechanism of the *fortepiano*.¹² His third law—which holds that to every action there is an equal and opposite reaction—is also applicable to piano-key action.

Newton's influence on European learned societies around 1700 was profound. A common denominator in many academic discussions was an interest in demonstrating the principles he had outlined. The study of mechanics not only offered explanations of the principles of force and motion but also gave clues to how to regulate such forces. The hammer mechanism of the *fortepiano* can easily be read as an exercise in Newtonian mechanics, even though it cannot be claimed that Cristofori intentionally developed the action to instantiate Newton's laws.

In addition to force and motion, academicians discussed oscillation (relevant to sound generation) and leverage (relevant to key action). Thus all four principles were arguably related to the construction of the *fortepiano*. In a word, the experimental design of an instrument employing the mechanical principles on which the *fortepiano* was based would have been ripe for conception anywhere within the Newtonian world of 1699, or arguably a few years sooner.

Scientific communication in Cristofori's time

Not all noblemen were rich, but nearly all valued learning. Besides cultivating ancient languages and translating them into the vernacular, academicians had an insatiable desire to understand how things worked or might be made to work. Three Italian academicians who figure in this account—Apostolo Zeno (1667–1750), Scipione Maffei (1675–1755) and Alessandro Marcello (1668–1747)—were noblemen from Venice or the Veneto.¹³ From their origins on the shaded slopes of the Roman hill called the Janiculum,¹⁴ the spreading Arcadian colonies converged in complex ways with the scientific curiosity of the time. The Arcadian colony that was organized informally in Venice in 1691 was not

formally admitted to the network until 1697. Gio. Maria Crescimbeni's *L'Arcadia*¹⁵ indicates that the first two of the 15 members admitted to the Venetian colony of Arcadia (the Accademia degli Animosi) at its initial induction of 29 April 1698 were Apostolo Zeno (under the pseudonym 'Emaro Simbolio') and Scipione Maffei ('Orildo Berenteatico'). Alessandro Marcello ('Eterio Stinfalico') was admitted on 10 July 1698. The Arcadians' lasting achievement, and the value which linked their interests in poetry and science, was their emphasis on naturalness and simplicity, in imitation of the pristine life of the fabled Peloponnese in its vague mythological past. Although the members were few and select, meetings (*radunanze*) of the Animosi drew as many as 400 persons.¹⁶ These audiences included noblewomen and a small percentage of well-educated persons who were learned but not of noble birth. The less immediately visible activity of academicians all over Europe was to create periodicals which could disseminate news about both scientific and literary achievements to a broader public.¹⁷

Apostolo Zeno had hoped while at school to study mathematics and science, but circumstances dictated other directions. In 1696 he helped Girolamo Albrizzi, another Venetian nobleman with political ambitions, compile the first issue of the first scientifically oriented periodical in Venice, the *Galleria di Minerva, ovvero Notizie universali* (1697–1717). The *Galleria* aimed to discuss writings 'not only of the present century but also of those past, whether concerning sacred or secular subjects, including rhetoric, poetics, politics, history, geography, chronology, theology, philosophy, mathematics, medicine, law and finally every science and art, *whether mechanical or liberal*' (emphasis mine). Its small print described designs for the forerunners of typewriters and horseless carriages, for navigation routes, and for mechanical inventions—in short, for a multitude of objects that only the Industrial Revolution would be able to satisfy.¹⁸

In his proposed (Arcadian) reform of Venetian opera, Zeno called for a restoration of the Aristotelian unities of place, time and action and a purge of self-important distractions (i.e. comic scenes and excessively ornate singing). He was himself an active librettist from 1695 until the end of his

life. In 1700 he joined the Accademia Fiorentina.¹⁹ His many writings included a history of Italian academies.²⁰ In 1706 he obtained the position of ducal librarian through family connections.²¹

By 1710, when Zeno and Scipione Maffei began to publish the bimonthly *Giornale de' letterati d'Italia*, Zeno was looking for a more tangible and immediate way of communicating with the literate public than drama provided.²² In a letter of 14 April 1703 to Anton Francesco Marmi he expressed the intention of creating a newsletter that would be not his, but that of all Italians. His hope was to create a collective sense of Italian identity (much as the Arcadian movement had aimed to do) among the intelligentsia. Only a year later he assumed new administrative duties as prior of one of Venice's two quarantine stations, the Lazzaretto Vecchio. In recognition of his immense learning, he was named court poet of the Austrian Empire in 1718 and moved to Vienna,²³ whereupon Arcadian values lost their Italian ethnocentricity and implanted themselves in imperial cultural endeavours for decades to come.

Maffei, a peripatetic Veronese marquis as well as a poet, soldier and archaeologist, had joined the Arcadian Academy at Rome in 1699. His direct collaboration with Zeno, which began in Padua in 1709, was short-lived, and so was his involvement in the *Giornale*. After a trip to Turin in 1710 he settled in Vienna (paving the way for Zeno's appointment in 1718), and devoted himself largely to the study of Italian drama. Returning to Verona, he filled his palace with archaeological treasures and built an observatory adjacent to it.²⁴ He did not abandon poetry, drama or music. (His *La fida ninfa*, for example, was set by Vivaldi for performance in Verona in 1732.)

Alessandro Marcello was a lifelong friend of Zeno. Even more fully than Zeno himself, Marcello characterized both the successes and the excesses of his age. Particularly between the years 1705 and 1720 he was a dilettante of practically everything of an artistic nature: he drew, painted and sculpted; wrote poetry; and composed cantatas and instrumental pieces.²⁵ He too developed links, after 1706, with the Accademia Fiorentina,²⁶ where he would have come into close contact with both academic thought

and the cultural events associated with the Medici household.

After he moved to Vienna, Zeno became lavish in his praise for Marcello. In 1720 he wrote a laudatory description of Marcello's Latin epigrams (Paris, 1719). The *Giornale* anonymously noted the publication of Alessandro's *Cantate* 'of 1718' in 1720, some dozen years after their actual appearance (1708). Maffei's description of the *gravecembalo* from the *Giornale* was reprinted as a stand-alone publication in 1719,²⁷ perhaps on account of prompting by Zeno.

Marcello was in many ways a more striking figure than Zeno. He exhibited an exploratory approach to everything around him. He engaged in commerce and design, and even dabbled in scientific invention. His proposal for a system of invisible writing, reportedly developed in 1718, was published in the *Actorum eruditorum* (Leipzig, 1729). ('Invisible writing' systems were a staple of private military and diplomatic communications in an age paranoid about espionage and committed to enciphering diplomatic correspondence.) The *Giornale* described him as a 'Venetian gentleman who interposes among his serious obligations to the most important magistracies of this Republic, for his recreation and with great esteem, the pleasant studies of poetry, music, sound and painting', and noted that in addition he was 'exceedingly kind'.²⁸

Maffei's account of the fortepiano

Maffei's pursuit of Arcadian values was so total that his interest became a sort of anxiety. Inducted into the Academy in Rome in 1698, he vigorously corresponded with many members of the Arcadian movement, among them Antonio Vallisnieri and Lodovico Muratori, with whom he began formal correspondences in 1707 and 1709 respectively. His first letter to Muratori came from Florence.²⁹ In 1707 he had also initiated a correspondence, and had probably met Zeno. It is believed that the plans for the establishment of the *Giornale* were laid by Zeno, Maffei and Vallisnieri by the spring of 1709. It was Maffei who then went to Florence to seek an endorsement of the enterprise from Prince Ferdinand.³⁰ He sent to Zeno the dedicatory letter and preface to the first issue before retiring to the baths at Lucca. Before the first issue appeared, he had travelled to

Rome to dedicate a different book to the pope. Some of the anonymous writings in the *Giornale* may well have been by him.³¹

When we turn to Maffei's report of the 'new invention of a *gravecembalo* with *piano* and *forte*, to which are added some considerations on musical instruments', from vol.5 of the *Giornale de' letterati*,³² we may be dealing with a document written in Florence during the spring of 1709. When we examine the content, we can see how many of the elements mentioned were intended to appeal to a scientifically literate public with an Arcadian orientation. The structure of the account exhibits a polished rhetorical sense: it lays out two chief features of the new design, enumerates and redresses the rebuttals of its detractors, and then gives the familiar mechanical description of its construction. Nested within this structure is reference to the rhetorical possibilities of dynamic control in musical performance.

If the value of an invention can be measured by its novelty and its difficulty, then the one we are about to describe is certainly not inferior to any others of our time.

Anyone who enjoys music will tell you that one of the principal sources of pleasure for listeners is the difference between softness and loudness (that is in [differentiating] [rhetorical] questions and answers [*proposte, risposte*], or when a diminution of sound is achieved by allowing the voice to fade little by little and then a sudden loudness occurs. This artifice is used frequently and to marvellous effect in the great concerts given in Rome, with incredible delight to whomever is pleased by the perfection of art.

String instruments are excellent for these purposes, but the *gravecembalo* is deprived of the opportunity to effect them. Only he with an inordinately vain imagination would attempt to make a [keyboard] instrument with this capability. However, just such an invention has been not only happily conceived but also made in Florence by Bartolommeo Cristofali, a Paduan, salaried cembalist of the Most Serene Prince of Tuscany. He has already made three at the normal size of other *gravecembali*, and all have been perfectly built.

The production of these loud or soft tones depends on the amount of force used by the player, such that besides hearing loud and soft sounds [the listener] will also hear the [same] degradation [gradual diminution of tone] and diversity [?] of the voice [as one might hear] in a cello.

Some teachers have withheld the great praise that such an invention merits [for several reasons]

First, because they have not appreciated the amount of ingenuity required to overcome the difficulties, and [second]

the marvellous delicacy of the handiwork required to carry out the work;

Because the [resulting] voice of the [new] instrument, in contrast to that of the ordinary one, might be too soft and dull [*ottusa*] . . . but here you should be advised that it best to listen to these instruments at a distance. Some oppose it because it is not as loud as other *gravecembali*.

Note that these are all very measured criticisms, framed in a general argument which is entirely symmetrical, according to the rhetorical models widely used by academicians.

To the first I would respond that the instrument has enough voice to be heard if the keys are pressed properly, and secondly that one must use it on its own terms, not on those developed for other [kinds of] instruments.

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This is properly speaking a chamber instrument and is not suited to music in church or for a great orchestra. Think of how many [other] instruments exist which can similarly not be used on such occasions but which are nonetheless delightful!

To accompany a singer, and to double an instrument, and also for a modest concert [this instrument] is perfectly suited, even though this intention may not have been the motivating force [behind its creation], which may have been to be played alone, like the lute, the harp, the six-string viols and others of the suavest instruments.³³

But truly the major opposition that this new instrument has encountered is that no one knows on first encountering it how to play it, because it is not enough to [know how to] play ordinary keyboard instruments perfectly. Because it is a new instrument, it is necessary to find a person who is willing to make a particular study of it, in order to [learn to] regulate the application of diverse *misure* in playing the keys, and the precious degradation of time and place, in order to play it