Divided Choirs: Myth or reality? Acoustic Experiments in St Mark's Basilica, Venice

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The premise on which this research[1] is based suggests that the architects and musicians who operated in Venice during the Renaissance period were much more knowledgeable about the concepts of acoustic physics than was until recently thought, and that the Counter-Reformation brought awareness of the power of music in inspiring devotion. The aim of this research is to explore the ways in which their architectural and musical creations (referring, in this article, only to St Mark's Basilica) show a genuine attempt (not always uniformly successful) to exploit acoustic effects for religious purposes.

In the year 2005 the Department of History of Art at Cambridge University founded *CAMERA*, the *Centre for Acoustic and Musical Experiments in Renaissance Architecture*. At the Centre's first conference, held at the Fondazione Cini in Venice on the 8th and 9th of September 2005, experts in the three disciplines came together to exchange ideas and compare the extent of their knowledge in their respective fields. A year later, in September 2006, the same group of experts met again, this time in Cambridge, for an informal workshop. Together they planned a series of experiments to be carried out in Spring 2007 in a number of churches in Venice. Although a number of specialists in the field of ancient music, including Sir John Eliot Gardiner, had already attempted to re-create *in situ* Renaissance liturgy in Venice, such systematic tests of acoustics in various churches had never been made. The climax of this research was to be a series of choral experiments

carried out by the Choir of St. John's College, Cambridge, between the 8th and the 15th of April 2007. This Choir was chosen for its acknowledged excellence in the field of sacred music and for its outstanding ability in singing the most complex pieces of Renaissance polyphonic music, even at first sight. The Choir consisted of fifteen men and seventeen children and was conducted by David Hill. While in Venice they stayed at the Spedale della Pietà, the institution where Antonio Vivaldi had worked in the early eighteenth century. As well as carrying out acoustic experiments for the research project, the Choir sang at Easter Monday Vespers in St Mark's and gave two public concerts.

In order to compare the quality of the acoustic surveys carried out inside the churches with the sound actually perceived by listeners, a precise system of acoustic measurement was devised, using the technologies and information supplied by the *Laboratorio di Acustica Musicale e Architettonica* (Musical and Architectural Acoustics Laboratory) at the *Fondazione Scuola di San Giorgio in Venezia*, under the direction of Davide Bonsi.

It is interesting to note how many factors are brought into play when approaching ancient music. These include general practice in performance; workmanship and characteristics of original instruments; and the manner of music-making during the liturgy. The acoustic properties of spaces where music was performed have been little studied, and this is why live choral music was central to the project. The search for historical authenticity in performance was, obviously, not the prime concern; the researchers considered this to be an unreachable goal. They intended rather to show that successive architectural alterations to religious buildings should always be taken into consideration. Simulations of 'original' performances were compromised by a number of factors, including alterations to the decoration of the churches in question, the rebuilding of organs, the difference in numbers

of the congregation, and the employment of counter-tenors instead of castrati.

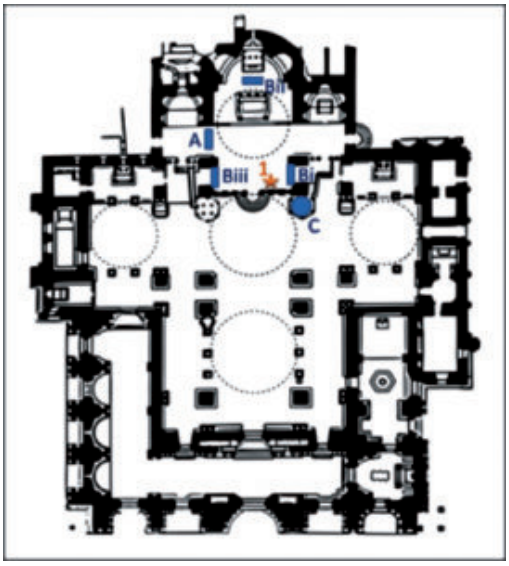


Figure 1: positioning of the singers (A, B, C) and of the microphone (1) during the acoustic experiments in St Mark's

In the course of the choral experiments held in St Mark's Basilica, St. John's College Choir sang – as has already been noted – at Easter Monday Vespers; they were positioned in the north organ loft, the one preferred by musicians of our time. This was a difficult position for the performance of choral music because there was no direct sightline, or line of sound, between the singers and the congregation in the nave, where the reverberation was such as to produce an effect more atmospheric than musical. The harmonies were indistinct and any counterpoint or rhythmic elaboration sounded confused. Acoustic measurements confirmed that sound originating in the organ loft and measured by a microphone placed underneath the central dome was worse – acoustically and physically speaking – than any other 'production-reception' combination measured in any other space within the basilica. Conversely, when the microphone was placed in the space occupied by the Doge's throne, much better results were obtained because of reduced

reverberation, but the clarity of the sound remained somewhat poor.

In the first experiment *(track 1 – http://bit.ly/2hSslGJ)* two tenors positioned in the north loft (figure 1, position A) sang Monteverdi's *Salve Regina*. Even with the microphone positioned in the sanctuary below, the soloists' voices seemed distant. The sound seemed to come from above, distributed uniformly, with little emphasis of direction on the left side (looking towards the high altar). The voices sound as if trapped in the sanctuary space and the singers themselves did not obtain much of a response from the natural resonance of the space. They complained that the sound was hard and dry, and attributed this to the large quantity of wood in the organ loft. To the listener in the nave, the two tenors' voices sounded far away and indistinct.

1.1. The apse and the pulpits

Figure 2: the entrance to the sanctuary in St Mark's Basilica; notice the screen surmounted by fourteen statues, and the two pulpits

The alterations made to the eastern end of St Mark's in the sixteenth century had a number of significant implications for the role of music in the Doge's celebrations. These alterations were carried out under the supervision of the

Florentine sculptor and architect Jacopo Sansovino (figure 2). Sansovino had come to Venice in 1527, and following his triumphant restoration of the dome of the basilica he was given the post of superintendent responsible for the buildings around St Mark's Square, known as the Procurazia di San Marco. The careers of musician Adrian Willaert and Sansovino evolved along parallel lines, both men greatly involved in their respective fields: the former occupied with the musical life of the basilica, the latter with its maintenance and decoration. One can imagine that they would sometimes find themselves working shoulder to shoulder. If we wish to understand Sansovino's alterations, we need to look at the present disposition of the church. The nave leads to a raised sanctuary with apse, reached by five steps (figure 3), beneath which is the crypt housing the relics of St Mark. This space is separated from the nave by a *jubé* or *iconostasis*, completed by stonemasons Jacobello and Pier Paolo dalle Masegne in 1394, consisting in eight marble columns supporting a series of fourteen statues. On the other side of the sanctuary are two small chapels with apses, dedicated respectively to St Peter and St Clement, reached through great arches which support the upper level of the organ lofts. The space behind the iconostasis or screen was known, in Sansovino's time, as the *choro;* but where the singers were actually positioned is a complicated question, much debated in recent years. The trials carried out in April 2007 were designed to test a number of possible scenarios for the production of music, bearing in mind of course that the sixteenth century was a time of constant experiments in the field of music. On the outer side of the screen two marble pulpits face the high altar: on the right the hexagonal *pulpitum magnum cantorum*, also called *bigonzo*, and on the left a two-story structure known as *pulpitum novum lectionum*.

Figure 3: Alessandro Piazza, The Doge Francesco Morosini receiving the 'stocco' sword and the pileus in St Mark's Basilica, oil on canvas, c. 1700 (Correr Museum, Venice)

These venerable pulpits in precious marble date from the early thirteenth century. Giovanni Stringa, Master of Ceremonies at St Mark's, describes them when writing about the life of St Mark the Evangelist and St Mark's church:

Let us look at the screen, flanked by two pulpits, one on the right and one on the left. The pulpit on the right (looking from the high altar) is on two levels and is surmounted by columns. On the major feast days, usually five times a year: Christmas, the Annunciation of Our Lady, Palm Sunday, Good Friday and Easter day, the Epistle is chanted and a sermon proffered by the city's most famous priests, in the presence of the Doge and his Court […]. The upper level is covered by a pyramid-shaped bronze canopy surmounted by a dome, and here the Gospel is chanted.

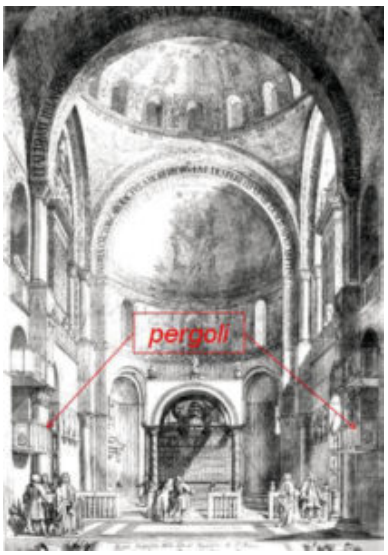
And describing the *bigonzo*, Stringa adds:

The other pulpit on the left (looking from the high altar) is octagonal in shape, and lower. Here the Doge is presented to his people after his election, and here the Divine Office is

normally chanted, especially when the Doge and the Court are present in the church.

It is important to remember that Stringa's description was written after a number of significant alterations had been carried out by Sansovino. In about 1530 Doge Andrea Gritti, unable to mount the steps leading to the *bigonzo* because incapacitated by gout and obesity, and therefore unable to occupy the position usual for the Doge when celebrating church festivals, began to occupy the chair previously installed for use by the *primicerio* (the highest-ranking priest present) just beyond the screen. Consequently, in 1535, a new throne for the Doge, made of walnut and flanked by other chairs for dignitaries, was installed here. This made a huge difference to ceremonies taking place in the presence of the Doge, because it meant that the Doge and his Court were now seated in a sacred space formerly reserved for the clergy (figure 4). The present appearance of the sanctuary is completely different from the way it appeared after Sansovino's alterations, because unfortunately most of the chairs were removed in 1955. However, the previous layout was well described by Giovanni Stringa in his preface to Francesco Sansovino's Guide to Venice dating from 1604.

1.2. Singers' Positions



Picture 4: Antonio

Visentini (1688-1782), view of the sanctuary in St Mark’s Basilica showing Sansovino’s pergolo balconies, taken from Iconografia della Ducal Basilica dell’Evangelista Marco

The aim of the choral experiments carried out in April 2007 was to consider the acoustic implications of the various positions occupied by the singers in St Mark’s. It is important to stress that these investigations concentrated on music of the mid-sixteenth century; music composed after this time became progressively more complex and its performance evolved to include several choirs at once and a large number of instruments. The complicated positioning of singers and musicians is well illustrated in a seventeenth-century painting in the Correr Museum; the repertoire in use in Willaert’s time, however, did not require such complex organisation. In the April 2007 experiments various combinations were tested; the only position not tested was to place the singers in the lofts in the transept: there is no historic evidence to support this practice and also the considerable distance – sixty metres – between the two lofts would have caused an insuperable problem of sound delay. In all the trials carried out, the microphone was placed in front of the space once occupied by the Doge’s throne, just behind the screen (looking from the nave towards the altar) on the south side, because at this time (the mid-sixteenth century) the Doge and his Court were the most important members of the congregation, those for whom the music was performed. During the trials, the listeners present were invited to complete a questionnaire, noting also whereabouts in the church they were seated.

Picture 5: Giovanni Antonio Canal, Celebration of the Easter Mass in St Mark's, pen and ink drawing, 1766 (Hamburg, Kunsthalle)

The effect made by Gregorian chant in the sanctuary apse was tested by performing the psalm *Domine probasti me* in Willaert's setting, where a plainchant choir alternates with a polyphonic quartet (track 2 – http://bit.ly/2hNtMcn). The plainchant singers were placed behind the high altar, while the quartet took their places in the small balcony called a *pergolo* (*translator's note: see figure 4*) on the right when facing the altar (figure 1, position Bi-Bii). The vault behind the apse enabled the plainchant singers to produce mystic sound with reverberation, where the words were easy to understand. The quartet positioned in the *pergolo*, however, produced a much clearer, more focused sound, because their voices reverberated inside a closed space before being projected into the sanctuary. The same psalm was also performed from the two *pergolo* balconies (figure 1, position

Bi-Biii), with the plainchant singers directly facing the polyphonic group (track 3 – http://bit.ly/2gUXXtK). In this configuration the sound of the plainchant singers was more directional and had less reverberation than when they had sung behind the high altar, and the effect of a dialogue between the two groups was more immediate.

The following experiment was a performance of a psalm for divided choirs, Willaert's *Laudate Pueri Dominum* (track 4 – http://bit.ly/2h3nYdu) sung by two polyphonic quartets, one in each of the two *pergolo* balconies (figure 1, position Bi-Biii): the sound was exceptionally clear, and the spatial separation between the two groups was ideal. For the listeners in the sanctuary – the Doge and his Court – the effect must have been breathtaking: the volume just right and the separation of the voices clear and distinct, while the effect of a 'conversation' taking place in this confined space added a touch of drama.

The effect of a polyphonic piece performed in the *bigonzo* (figure 1, position C) was tested employing the motet for six voices *Timor et tremor* by Giovanni Gabrieli, a piece which well conveys a sense of fear through the undulation of the voices, with pauses suggesting hesitation (track 5 – http://bit.ly/2hBbhYe). As can be seen in Canaletto's drawing, the singers face the high altar, allowing their voices to be projected into the sanctuary space. The piece was performed in real parts, that is by one chorister for each part, with the sole addition of another voice to the soprano line. The resulting sound was beautiful: the voices blended perfectly and were clearly projected into the sanctuary space, although the sound no longer had the remarkably clear definition attained when performed in the two *pergolo* balconies.

Given the spatial complexity of a church with five domes, it came as a surprise to discover that the clarity of sound perceived by a listener in the sanctuary was of an acoustic

quality comparable to that of a modern concert hall. Fortunately, any undesirable focusing of sound was averted by the slight irregularities in the mosaic surface inside the dome. The marble screen served as a protective barrier to excessive reverberation of sound from other spaces in the church. In other words, the sanctuary gives the effect of a church within a church, creating the conditions for producing a better sound than in any other space in the basilica. We can therefore conclude that the combination of singers in the *pergolo* balconies and listeners in the sanctuary resulted in the clearest and most directional sound, while the sound heard by the listeners in the nave was confused and unclear. If the Doge's intention was to impress his guests by means of the new kind of music written for St Mark's, it is evident that the creation of the *pergolo* balconies was a brilliant solution to the problem of a usually unpromising acoustic space.

In conclusion, the "sound", meaning the successful performance of these pieces of music in St Mark's or in any other performance space within a religious building, depends – as has been stated – on a complex interplay of numerous factors, not only musical. The notes written on the score, the instrumentation, the embellishments improvised 'on the spot', are all important factors; equally fundamental is the positioning of the choral groups in relation to the liturgical and ceremonial requirements of the day, and in relation to the architectural space in question and – by no means least – to the specific features of the composition. In short, singers need to consider cause and effect of the architectural features of the performance space and the predetermined stratagems, different for every space, every composition and – if possible – every single performance, required for ideal results.

Translated by Gillian Forlivesi Heywood, Italy/UK

[1]*The research is extensively described in 'Sound & Space in*

Renaissance Venice’ by D. Howard and L. Moretti