

PORCELAIN

Kate Moore

Abstract: Time through history can be marked by the passing of generations. Archeological sites reveal the intimate secrets of our ancient ancestors through thousands of pieces of broken pottery recovered from the ground. Piecing together these shards can be likened to reconstructing a jigsaw puzzle, one of long forgotten civilisations, places, memories and stories.

It was a fascination for the shape of ancient hills that sparked my interest in porcelain. Archeology is a secret passion of mine that stems from my early childhood growing up in a medieval village in Oxfordshire in the UK. From the earliest moment I was aware that the land held the secret treasures of the past, hidden under the grass. Going on walks with my family, I was in search of carved flint, spear-heads of the first people. I knew they roamed the fields where I played childhood games. My playground was the half-covered walls of Neolithic ruins, quarries and the foundations of castles. Stone was something that held the key to understanding why the hills were shaped that way. They had been carved and sculpted to record the heritage and culture of those people, like an archive written in the landscape, their treasures lying dormant in the soil. From an early age I was tuned to the way in which the landscape spelled out a treasure map and adventure story of thousands of years of people coming and going, reinventing themselves time and again. It was the stone that told the tale. Wood decomposes, metal tarnishes, all is eaten away and returns to the ground except for stone and earthenware, which lies forever waiting for someone to pick up the pieces, putting them together once again.

I began excavating in my own way. Rather than excavating the ground, I turned to music, my language, and the vehicle for my own imaginary landscapes. I became an archaeologist of the eerie ephemeral places mapped out in scores and brought to life in performance. Taking a patch of music and re-examining it from the point of view of an archaeologist, my aim was to uncover its rich and ancient past encoded within every note, every rhythm, every sequence of patterns. I began to think about the origin of the word itself. Muses presided over the musical arts. They were the daughters of Mnemosyne, the goddess of memory.

Memories, encapsulated in song, poetry and theatre, tragic, lyric, comedic and satiric were passed on from one generation to the next by word of mouth and were engraved in stone, creating mnemonics for future generations to discover and cherish, where the oral history became timeless. Stone was etched and carved with pictograms and

symbols containing meaning to those who knew their language. Memories became statues, theatres, buildings and monuments where oratorios, plays and concerts were performed. Books were written to record the songs and numerical systems were invented to retain their meaning to trigger and relive the events that shaped us. They were collected, recollected, housed and displayed within museums.

Memories are found in words. The meaning of words may shift through the ages but the essence of where they began remains knotted into strings of syllables. For example, 'Mem', the Phoenician word for water: it represents the numerical value of 40 and it was for 40 years that Moses wandered in the desert. I became captivated by a story derived from the Surat al Baqarah in the Quran where Moses issued forth 12 rivers from a rock, each with its own unique melody.¹ The melodies of the 12 rivers became 12 scales upon which the strings of the oud were tuned. Within this story, I was intrigued by two details, that of the flow of water and that of the stationary rock, where movement and stasis co-exist. From the rock flowed the water that created a beautiful sound. Twelve rivers became 12 unique melodies. Moses struck a rock, setting it in motion, creating vibration from which flowed water and melody. Water is significant to the name of Music. The Muses were water nymphs and both Moses 'Musa' and the Muses derive their name from 'Mu', the twelfth letter of the Greek alphabet meaning water. Moses was himself drawn from water as he was rescued as a baby from the river.

Musiqā, the Arabic word for music is in two parts, 'Mus' and 'Iqa'. The entanglement of the two elements, the one and the other, the coexistence of opposites, the rock and water are symbiotic in their polarity. They represent balance, where the 'Mu' of water, flow and melody is given form and shape by the 'iqa' of metre and rhythm.²

The number 12 is significant because the hours in a day are based on the 12 constellations of the zodiac, marking the division of the year into months and seasons. The position of a fixed-point relative to a moving body enables the tracking of orbits. Against a fixed point such as a monolith, the sky can be deciphered, following a star through its annual journey across the horizon until the moment where it is born again in the same position.

Marking the changing position of the stars with sound such as the chime of a bell, music becomes a time-keeping device. The study of music was itself part of the Quadrivium where Arithmetic, Geometry, Music and Astronomy gave definition to physics through the observation of line, shape and movement. Where arithmetic draws a sequence made tangible in its formation of a solid it can be rotated via counterpoint, where a line becomes a rotating shape, a model of the universe, an anaphoric clock.

An early form of time-keeping based on the stars, was the water-clock. The Klepsydra, literally meaning 'water-thief', was based on the principle that a measure of water would seep through a vessel in the time it would take for a succession of 36 decan stars to rise. An intriguing artefact remaining from antiquity, is an alabaster vessel from the Temple of Karnak under the rule of King Amenhotep III. This vessel is an exquisite water-clock, carved with depictions of the personified stars and deities, which are revealed as the water level

¹ Surat al Baqara, Quran 2:60.

² Iqa refers to the iqa'at being rhythmic modes of classical Arabic music theory.

plunges through a small siphon towards the bottom of the vessel. This piece is a reminder of the sacred nature of time and its origins in the natural cycle of seasons and stars.

The idea of the *klepsydra*, a ceramic pot that kept track of the hours, led me to wonder whether it was a musical object, where water flowing through a ceramic vessel would create sound that could be likened to the flow of rivers through Moses' rock. Fine ceramic material, earthenware fired to a high temperature, creates a crystal structure where the fragile yet hard surfaces are resonant, sounding with a pure tone like a bell. Drops of water falling on to a ceramic pot from a certain height strike the surface with a clear pitch pleasing to listen to.

Taking the idea that a *klepsydra* was a musical instrument made of stone and water, I wrote *Klepsydra* for ensemble and porcelain water clock for the Asko/Schoenberg ensemble in 2009. For this piece I designed 36 porcelain bells that were realised by a local porcelain-maker in The Hague. The bells were suspended beneath four streams of water seeping slowly from suspended vessels wherein a drop of water fell upon the bells causing them to resound in rhythmic patterns. Each stream of water was amplified through four speakers situated around the audience. The patterns of the drops phased against each other, slowing down as the water level lowered. The rhythms of the water and the instruments of the ensemble, after a loud clap from a bass drum and lower brass, are set in motion, like a sonic anaphoric clock. The piece runs for 15 minutes, divided into five cycles of 36 triads in moving canons.

Time-keeping in the piece is embellished and coloured by objects sounding like the inner workings of cogs and weights in a clock. The objects consist of prepared bicycle wheels and unpitched metal chimes. They mark the geometric division of the piece into whole number proportions: 2, 3, 4 and 5. The tempo is set to the second so that the sequence of triads moves at the same rate as stars rising. The conductor does not use a mechanical device to derive the tempo and the metric interpretation is based on a human sense of the right feeling of time. This in itself is a curious phenomenon and is explored by introducing recordings of musicians playing the triadic sequence in their own timing based on the feeling of a second. The result is that each person's interpretation is vastly varied and, when all the recordings are layered, a cloud-like texture is formed. I explore this phenomenon in detail in my piece *Sensitive Spot* (2005), where a pianist records the same piece over and again, each performance perfectly executed. Yet when layered with all the other performances, it is apparent that none are the same. The resultant sound-world of the piece is an intricate tapestry of evolving textures.

The *klepsydra* led me to investigate earthen instruments further. I began to collect found ceramic vessels from junk stores and recycling shops. I wanted to know what their pitch would be and which shapes would be the most resonant. I collected hundreds of pots, vases and bowls, all of which were shades of white. I laid them all out on the floor from the highest sounding vessels to the lowest and began to analyse them. The lowest pitch was situated around A = 220 Hz and extended above that by about three octaves or more. The most commonly found pitch was clustered around G-flat above middle C. I noted that the pitch of the vessel was not necessarily relative to size but more to do with thickness and quality of the clay. Some very small objects had a low pitch compared to large ones that had a high pitch. When placing them all next to each other, it was a

haphazard cornucopia of shapes and sizes. With all the pots displayed on the floor from highest to lowest pitch, the visual appearance did not reflect the sonic order. This was exciting because the logic of the collection was hidden in the world of sound rather than the more immediate visual appearance.

I began to devise a sound sculpture named *Bone China* (2014), which was premiered at the Willem II Fabriek for November Music in 's-Hertogenbosch. Placing the collection of resonant vessels into scales that sounded pleasing to my ears, I ordered the pitches to create fragmentary melodies that spoke directly from the found objects. Placing the pots in circles to make the melodies into loops, I devised mechanical spokes with suspended hammers made from soft modelling clay. These were attached to motors that were positioned in the middle of the circle of pots, slowly revolving. The hammers had to be the right weight and density to strike the ceramic surface where it was most resonant. The motorised spokes circled the pots, dragging the hammers lightly across the edge of their surface, plucking them as though fingers across a string.

The melodies of the pots intrigued me. Once again, I wondered about the rivers of Moses where a sequence of pitched ceramic pots could have significant meaning encoded in their melody. These pots could be likened to an ancient form of recording. Like a record player, this musical automata with its fixed scales could be moved and reconstructed and still maintain the same melody. I began to make clusters of different scales. Each cluster had a motor that could be automatically turned on at certain hours of the day, so that each hour would sound different. In thinking about scales for certain hours, I could not help but think of classical Indian ragas whose melodies must be played in accordance with hour and season, mood, and state of mind.

The Jal Tarang, meaning water and waves, is an ancient Indian instrument, believed to be one of the oldest instruments known. It is a succession of ceramic bowls finely tuned with water. The pitches are precise and can be perfected easily by adding drops to the pool, making them the ideal instrument for the exploration of temperament and tuning systems. Having experimented extensively with tuned porcelain bowls and tiles in a series of works including *Klepsydra Instruments* (2009) *Rain Project* (2010) *Sarabande* (2013) *Mobile and Sculpture* (2014) and *Bone China* (2014), I developed a double Jal Tarang consisting of two sets of porcelain bowls for my cello concerto, scored for solo cello, 2 percussionists and ensemble. The second movement, based on extended rhythmic cycles in self-similar patterns that expand and contract, maintains the proportion of beats where the rhythmic cells are reflected in the formation of large scale structures. The Jal Tarang is simultaneously a melodic and a percussive instrument which embodies the idea of the 'water measure', being both flow and metre.

Following a performance of *Mobile and Sculpture*, that featured a rotating hanging porcelain sound sculpture, I was commissioned by Slagwerk Den Haag (The Percussion Group of The Hague) and the European Ceramic Workshop (EKWC) to take a three month residency at the Oisterwijk workshops, to learn how to make porcelain myself and design moulds for my own porcelain instruments, to create a 70' performance installation for the percussionists. It was a generous commission and I began a new journey, starting from the elements: rock and water in the right measure.

I had first become interested in the sound of porcelain in my first year living in the Netherlands in 2002. I visited the Fries Museum in

Leeuwarden among others and became aware that ceramics held a special place in the Dutch national identity. Delft Blue is an iconic export, featuring blue patterns of Dutch life depicted on white tiles, plates and bowls. Originally Delftware was an imitation of Chinese porcelain, first brought to Europe by Marco Polo. The knowledge of how to make porcelain was unknown in Europe until the eighteenth century. The Portuguese and the Dutch traded this valuable commodity en route from China. It was valued so highly in Europe that it was considered to be white gold. I picked up a cast-off porcelain vessel for one euro at the museum, tapped its surface and discovered the most captivatingly beautiful sound: a sonic treasure even more than a visual treasure.

Porcelain is made from kaolin and feldspar, crushed to a fine powder into which water is slowly added until the dust becomes a liquid paste. Making porcelain is a fascinating and fastidious process. Like music, it is one where the sensitivity of the maker is transferred directly to the material, responding to touch. One wrong move or negative energy will set the clay off kilter. With the right state of being and positive energy the clay becomes easy to work with.

Making a porcelain object requires patience and devotion. The material is so fine and fragile that the smallest miscalculation can have a disastrous effect. A hidden air bubble can make the clay crack in the kiln, or a tiny piece of metal trapped in the liquid before it dries can cause an explosion or become magma that infiltrates the clay making it impossible to remove. A lot of guesswork is necessary as the clay is not always predictable. In the process of making the shape, drying it in air, creating a bisque by firing to a low temperature and then firing it to a high temperature until the material becomes vitreous, one learns to intuit the clay rather than manipulate it. Person and clay must work together, getting to know how each other feels, sensing the mood and how the surrounding environment is affecting it, including the temperature and humidity. It is not an exaggeration to say that one must be kind to the clay and nurture it to get the best results.

It is a grounding process. Contact with the clay is like swimming in the ocean. It is transformative. The connection of one's body to the earthen liquid is calming, perhaps even therapeutic. The fineness of the wet clay's surface is close to skin. Submerging one's hands in the creamy white mixture feels like silk. It is delightful to touch. When removing one's hand, one is left with a perfectly white film of clay on one's skin, like Desdemona's skin, 'smooth as monumental alabaster'.³

The second part of the process involved learning to make plaster moulds. This is a very different process from mixing clay. Plaster is monstrosly difficult to work with, itchy on the skin, heavy, flipping from freezing cold to burning hot, fast to make, slow to dry. To mould it, one designs shell or frame with wood or plastic, then speedily pours the plaster into the shape and leaves it to set. Once set, it may take a few days to dry completely.

Preparation is necessary before entering the plaster room lest one should be careless and make the plaster lumpy or mix air-bubbles into the fast-drying material. Porcelain takes time, it needs to sit, to set, but plaster is a race against time. It forms a violent chemical reaction with water that once set in motion requires lightning speed to

³ William Shakespeare, *Othello*, Act 5, Scene 2.

mix, remove bubbles and pour, and it is heavy. The plaster room is like the emergency room in a hospital. If there is a leak in the structure of the mould, the plaster will bleed profusely and requires immediate surgery to prevent a flood of plaster which is hard to remove. It is an adrenalin rush and often takes a team effort to try and save it.

The process of making a porcelain instrument is slow and can take up to six weeks. One mixes the liquid clay, designs the moulds, awaits the drying process, first firing the instrument to form a bisque at a low temperature in the kiln and then mixing the glazes, painting the bisque with the glaze and then firing the pieces in the kiln at a very high temperature until the porcelain is very hard. By this point it is watertight and almost translucent. Now the kiln is opened to reveal the final piece. Only then can the sound be heard. The process can be likened to the tuning of a string in very slow motion, gradually tightening the tension of clay and glaze carefully so it does not snap.

The sound of porcelain reveals a lot about the object. When it is 'pinged' by gently flicking the object, the pitch and purity of the resulting sound reveals its quality, density, size and shape. If the object is in any way cracked, the ping will be dull or will rattle. If the shape is round or concave, the sound will be closer to a sine tone, particularly if the surfaces are even and balanced. The more irregular or asymmetric the shape, the richer the overtones and complex the sound. If it is a horseshoe shape, the sound is rich but there is a sub-tone that can be heard if one places the ear very close to the object. The pitch of the object is determined by a combination of size and thickness. If an object is large with thick walls, the pitch will be high; if it is small with thin walls the pitch is low. However, if an object is large with thin walls then the pitch is very low, and a small object with thick walls is very high. A concave shape, like a bell or bowl, has the ability to amplify the sound more effectively than if it was a flat shape such as a plate or disk. The most pleasing sounds were tubes as they were both pure in tone and projected powerfully. The tubes were the most stable shape and were least likely to crack or break.

The tubes had a double function. They could be played with a mallet as a percussion instrument or they could be blown as a wind instrument. The tubes that were blown became water-pipes. The pitch of the water-pipes changes as they are submerged in water, adding another interpretation to the concept of a musical water measure. Also made from porcelain, the pipes were formed by pouring liquid clay into a plaster tube attached to a tap. The clay remains in the mould for a few seconds before the tap is turned on, draining the liquid clay into a catchment below. A very thin film of porcelain sticks to the plaster and, as the plaster absorbs the moisture from the clay, the pipe detaches itself from the mould and can be extracted from its sheath. Whilst the clay is still wet, a notch is carved from one end of the pipe which becomes a mouth piece. Once fired, the instrument is played like a shakuhachi, blowing a column of focused air across the mouthpiece to set the frequency of the tube in motion. The tube can be overblown, reaching at least three harmonic partials as well as powerful prominent whistle tones.

The pipes are simple in their design. They could have been the first instrument. They look like bones and exude a prehistoric, elemental mystique, resembling bone-flutes. The water pipes are both musical and functional as they are used to measure a depth of water by submerging the singing pipe and changing its pitch. In ancient worlds sound must have offered vital meanings hidden from the eyes. An instrument such as this would lend itself to revealing information

gathered from the natural world such as the depth of subterranean water.

I experimented with the sound of many porcelain shapes. I made a lexicon of acoustic objects from tubes, to disks, concaves, shards, ribs, tear-drops and gongs. The shapes that I became most interested in were the broken pieces. Many of my objects broke during the process and rather than throw the pieces away I turned them into new shapes by smoothing the edges and polishing the surfaces. I was fascinated by the way in which a whole could be broken into splinters, each with its own unique sound. I was also fascinated by the way in which objects broke: I would watch the porcelain clay dry in a large concave mould, a crack appear and slowly branch out to form many cracks like a network. The shapes, although random, seemed to relate to each other.

The shrinking process is fascinating to observe. The plaster quickly absorbs the moisture from the clay as it crawls across its surface, being led in one direction or the other. If it breaks during the shrinking process, the resulting splinters, shaped like elongated fingers, or into rough hexagons, were like the cracked earth of the desert.

Splinters, shards and broken pieces became the subject of my series *Porcelain* (2017) for five percussionists, hanging sound sculpture, pipe player and electronics. So fascinating were the broken shapes that I created a hanging sculpture from them. Hundreds of these pieces were smoothed, polished and fired, placed in the kiln to become immortalised as stone. Polishing the object before firing had the effect of weathered ceramics retrieved from an archeological dig. The rawness of their surface compared to the traditional idea of the shiny white porcelain tea cup, was attractive. Like ceramic artefacts drawn from the earth, exposed to the elements for thousands of years, each piece of porcelain was a treasure in its uniqueness.

I organised the pieces into size and pitch and began to string them from the ceiling: they were suspended as though exhumed from a grave, levitating in the air, forming lofty, cloud-like clusters of ephemeral pendants, sensitive to the currents and fluctuations of movement in the environment. I made soft clay beaters to hang next to the pieces like satellites, to gently tap the porcelain as it rocked. Softly, the stone-like debris began to chime patterns as they gently brushed against each other. Once the shards were hung, they reminded me of a photo I had seen taken by the Cassini space probe of the rings of Saturn.

The Cassini probe was launched in 1997 to observe the rings of Saturn and revealed them to be many thousands of shards of glassy material reflecting light from the sun. Like the pieces of broken ceramics recovered from earth by archeologists, the broken splinters of Saturn's rings reveal the ancient history of the planet itself, the glistening rocks drifting in the planet's gravitational field. The rings could have been the broken pottery found hidden beneath our feet, cold and dry, extracted by Time itself and immortalised in the heavens.

I had been working on the Cassini sculpture at Civitella Ranieri where I gave a performance and presentation on 13 September 2017. Perhaps it had been in my mind subconsciously, but I had not realised the fate of the Cassini probe when I named the sculpture. Two days after my performance, Cassini appeared in the news headlines, plummeting to its end on the surface of Saturn. From this moment my sculpture took on a new layer of meaning, a tribute to the end of the probe that had been on its journey for more than 20 years. The set of pieces for the percussionists to perform alongside the sculpture is entitled *Cassini Suite* and is based on a Saturnian magic square.

The celestial bodies Sun, Moon, Mars, Mercury, Jupiter, Venus and Saturn are associated with corresponding magic squares known as a kameas. Saturn's magic square is based on the numerals 1 to 9 forming a square of 3 where the addition of 3 numerals in each line is equal to 15.⁴

4	9	2
3	5	7
8	1	6

Saturn, from whom the planet derives its name as does the day of the week, Saturday, is the Roman god of Time. His mother was Gaia, the Earth, and his father, Uranus, the Sky. Depicted as a very old man, feeble and withered, slow and cumbersome, he was a stern and domineering patriarch, presiding over the annual cycle of the sowing and reaping of harvest. His symbol is the scythe and when the time is ripe he is the grim reaper. Saturn castrated his father with a scythe for pushing his father's children back into the womb of his mother. Later he swallows his own children but is then forced to regurgitate them again by his own son. This alternation of opposites, in which 'one action seems to reverse the other'⁵ is celebrated in the Roman feast of Saturnalia, celebrated around the winter solstice to mark the end of the old year and beginning of the new.

The planet Saturn's sidereal rotation is 29.5 years making it the slowest visible planet to make its way around the sun⁶ and so it can be seen in our sky for the longest period of time. Other planets come and go, rising and setting over the horizon, yet Saturn continues to lumber slowly. Laying out the porcelain instruments, the tubes, bells, disks and shards, across a table, I chose 30 instruments for each percussionist, 30 to represent the years of Saturn's orbit. Each percussionist has a similar set of instruments laid out on five tables. They weave rhythmic sequences across the duration of the suite, meeting up at the beginning of every paragraph and then dispersing, only to return once again. The percussionists cycle through the instruments in the same order but with varying speeds, creating a complex polyrhythmic structure. At the same time the regularity of the pulse is interrupted by the irregularity of the sounds in the Cassini Sculpture which is suspended in the middle of the stage. The tape part is built upon samples of the porcelain. Textures of polyrhythms are entangled with the cloud of chaotic currents. The combination with wind chimes and tape create an effervescent backdrop for the recorder player who intones melodies that are like chants. Close to the human voice and melancholy in character, the tenor recorder and porcelain water-pipe laments eerie ancient melodies.

All that goes around comes around. As the Cassini plummeted into Saturn's atmosphere, I began to disassemble the sculpture. With the care of a gallery handler, every shard was wrapped with string and foam and placed in an envelope with a number signifying the row in which the piece was hung and the position where it sat in the

⁴ Gershom Scholem, *Alchemy and Kabbalah* (Frankfurt am Main: Suhrkamp, 1994), p. 74.

⁵ Aveni, A., pp. 61–63.

⁶ Gunter Faure and Teresa Mensing, *Introduction to Planetary Science: The Geological Perspective*, (Dordrecht: Springer, 2007), p. 95.

line of pieces. It was packed up tightly into my hand luggage and taken back to Amsterdam where it was again packed alongside all the other instruments, in specially designed boxes with slots for each piece, a case for each percussionist. Porcelain is fragile and when a piece breaks so does one's heart.

When 'white fever' gripped Europe in the eighteenth century its symptoms were the desire to possess ever more porcelain and to touch its perfectly pure, glistening white surfaces. But even more than the allure of its material form, it is its sound that is so attractive, seductive, versatile and varied. The sound speaks through the material, resonating from the stone. Lost and buried in the ground for a thousand centuries, the ghostly white voice remains and, once excavated, tells the tale of rock and water from the moment it was created until the end of time.

Kate Moore, *Cassini*. Photo: Marco
Giugliarelli ©2017





Kate Moore, *Klepsydra*. Photo: Johan Nieuwenhuize ©2013