“Momento Mori: Remember your death”

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Research Project

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“How can Cemetery Architecture evolve as a building type, to reconnect mourners to the deceased and/or to their feelings?”

“Can pervasive computing be integrated into the architecture of cemetery buildings to provide a more comforting and reflective space for funerary service experiences?”
It seems there is a plea to reintegrate places of the dead back into modern society, establishing social and physical geographies that appear to have been lost. As Ken Worpole states, “Hi-tech architecture has created many new kinds of buildings and civil engineering wonders in the modern city, but it has yet to create anything original associated with the abiding cycle of human loss, fortitude and renewal”\(^1\). There is a real danger of creating modern cities without memory - cities in denial of death and humanity.

“Human life is interactive life, in which architecture has long set the stage”\(^2\). As the technological craze continues to rapidly invade our lives, digital devices that are worn, carried, and embedded into our physical conditions, have fundamentally altered the way in which people interact. In an era saturated with pervasive computing, we need to think about how humans and devices are able to co-exist.

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\(^1\) Ken Worpole, *Last Landscapes: The Architecture of the Cemetery in the West* (London: Reaktion Books Ltd, 2003), 30

As the great Louis Kahn once proclaimed,

“Spaces that serve, absorb their era’s new technologies, and they are reconfigured but not replaced by these…”

-Louis Kahn

These ubiquitous devices - whether they are sensors receiving input from the real world, or actuators, output devices that transform input into motion – they provide architecture with an opportunity to evolve from its traditionally static stature, to something more responsive to its environment.

The modernist movement saw architects disassociate buildings from the earth. Emphasis was put on doing away with the darkness below, and to create an international style that was not bound to earth, but could quite easily sit anywhere. “Pilotis, walls of seemingly frameless plate glass, were intended to lighten a buildings contact with the ground”

Could this be a reason why architecture appears to have turned its back on buildings of the dead? It seems, traditional cemetery buildings place great importance on its alliance with ‘place’ and grounding. The modern movement’s rejection of this relationship has left the architecture of cemetery buildings largely

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3 Ibid., 27
4 Edwin Heathcote, Monument Builders (West Sussex: Academy Editions, 1999), 12
disconnected from progressive ways of thinking, and essentially, the treatment of its spaces. At present, they are typically described as being places of banality and “poorly designed”\(^5\).

The aim of the project is to design new cemetery buildings for an existing burial site in the North Shore City region, and to investigate whether pervasive computing can be successfully utilized to create comforting and reflective spaces. Contrary to pervasive computings ‘dynamic’ qualities, a cemetery provides an antagonistic agenda – that of pausing and reflecting. It is these opposing ideas that have the potential to inject light, space and optimism back into the architecture of the dead, all of which could be possible through the use of ubiquitous devices and treatment of the building skin.

\(^5\) Worpole, *Last Landscapes*, 184
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PERVERSIVE COMPUTING

For centuries, the narratives of European classical architectural theorists, from Vitruvius to Rudolf Wittkower, have reiterated that architecture and the body are intrinsically connected. Likewise, as McCullough explains, “…as much as the body imposes a schema on space, architecture imposes a schema on the body”¹. As the complexity of technological gadgets that we use in our day to day lives increases, “…powerful machine vision systems and tracking technologies supplement the regulating power of architecture”².

¹ McCullough, Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing, 47
² Rafael Lozano-Hemmer, "Illuminating Embodiment", 79
Advancement of Technology

The development of technology followed the Industrial Revolution, “...replacing humans with machines wherever possible”\(^3\). Small computers are now worn and/or embedded into the environment, and in this age of ubiquitous computing, the human-to-computer ratio jumps from 1:1, and currently sits at around 1:1000’s. Emerging technologies such as mobile phones and the iPod, have initiated new protocols for organising space, time and boundaries around the body – they are physical, psychic and social prostheses. For example, wearing a pair of earphones enables one to move through a space without necessarily becoming too involved. People are withdrawn from their immediate environment, finding a way to deflect unwanted attention - a technology that enables people to retreat into their separate worlds. As McCullough elucidates, “electronic connections have eroded our ability to play different roles on stage and backstage in our lives”\(^4\). It becomes perceptible that as we retreat into the privacy of our media-altered realms, space becomes immaterial, our body awareness withers, and the direct experience of the environment we are in disappears. Where global travels have radically increased the diversity and frequency of passing social encounters, it could be said that the distraction of wearable and


\(^4\) McCullough, Digital Ground : Architecture, Pervasive Computing, and Environmental Knowing, 179
embedded technology has eroded the process of formalite. People are reduced to the recognition of global
designer logos on t-shirts or pre-dispositions about certain lifestyle choices, and these seem to dominate the
passing social encounter.

However, it is important to note that these devices also have the capacity to effect social experiences in a more
positive light. As Shepard explains, “…while wearing headphones not only keeps the world at bay, on a larger
scale, it can completely modulate one’s experience”5. Whether on the bus, walking through the city, or sitting on
a park bench; these spaces and places we move through while interacting with these embedded devices, develop
new meanings according to the recorded sounds that accompany them. “Information technology has become
ambient social infrastructure. This allies it with architecture”6.

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5 Mark Shepard, “Tactical Sound Garden Toolkit,” in Responsive Architectures : Subtle Technologies, ed. Philip Beesley, Sachiko
Hirosue, Jim Ruxton, Marion Trankle and Camille Turner (Toronto: Riverside Architectural Press, 2006), 90
6 McCullough, Digital Ground : Architecture, Pervasive Computing, and Environmental Knowing, 21
Issues of privacy

The approach to building component design is increasingly being fine-tuned, and the flexibility and movement achievable in new building systems is the result of the integration of embedded and smart computer devices. Architecture becomes operated in a new way – like an instrument. “Building structures now incorporate sensors, displays, and a range of mechanical functions much like what outfits a car today”\(^7\). Sensors that detect temperature, humidity, fire, light, and a myriad of other parameters, means that we can be sensed wherever we go. Ever more detailed information about our private lives leak out of buildings and the portable devices we have integrated into our daily routine have become accessible to anyone with the appropriate bit of hardware or software to access it. “Data that portrays our lives and lifestyles are accessible by so many individuals and organizations, that they can no longer claim to lie in some private realm”\(^8\). It could be said that ubiquitous computing to some extent, has aided the notion that our public and private spaces have become somewhat indistinguishable. The question then needs to be asked, can the idea of ubiquitous computing and all its privacy

\(^7\) Philip Beesley, Sachiko Hirosue and Jim Ruxton, “Toward Responsive Architectures,” in Responsive Architectures : Subtle Technologies, ed. Philip Beesley, Sachiko Hirosue, Jim Ruxton, Marion Trankle and Camille Turner (Toronto: Riverside Architectural Press, 2006), 7

\(^8\) “Distinguishing Concepts: Lexicons of Interactive Art and Architecture.”, 29
issues in sensing and gathering data, be employed into a building type that doesn’t necessarily regurgitate all its
data for the world to feed off? More importantly, can this technology re-connect the user with the space they
directly inhabit, rather than emphasize monotonous public and private spaces?
Responsive Architecture

“...Responsive environments – by definition spaces that interact with the people who use them, pass through them or by them...”

- Lucy Bullivant

Architecture, the built environment that organises the flow of people, has acquired a digital layer, and in doing so, has also extended architectures reach. “Responsiveness implies sensitivity” yet as we conventionally understand the complex construction of buildings, they are better described as being stable and isolated – sensitivitie’s antithesis. Rigidity and resistance to the external environment are customary qualities in building. Construction techniques are typically fabricated in a strict order. For example, a foundation and structural core in concrete might form the basis for steel columns supporting floor plates.

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10 Beesley, Hirosue and Ruxton, Toward Responsive Architectures, 3
So as the ethic of modern architecture evolves from the orthodox of being seemingly ‘static’ to something that has the ability to function through interfaces that facilitate interaction and prompts a ‘reaction’, there is a need to familiarise ourselves with the process of how all this technology operates. The form of mediation between the inner world (that being oneself), and the outside world (being our context), presupposes an event that is not wholly pre-programmed.

-Ubiquitous Devices

The process begins with input from the real world, received via sensors. Sensors respond to a change in state, and the “medium in which the state exists might be mechanical, electrical magnetic, hydrostatic, flowing, chemical, luminous or logical”11. With the advancement and complexity of technology to date, changes detected may even be a very discrete event.

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11 McCullough, *Digital Ground : Architecture, Pervasive Computing, and Environmental Knowing*, 75
Output devices in the form of *actuators* are then required to alter a systems state, triggered by a sensor. Actuators, a “mechanism that transforms an electrical input signal into motion”\(^\text{12}\), can also be used to translate and input information into displays and other sensory phenomena to engage with its users. By connecting these sensors, processors and actuators to building elements, architecture can begin to detect internal and external environmental stimuli. Examples of actuators currently being employed in responsive architectural projects are below.

*Linear Actuators*

A device that develops force and motion from an obtainable energy source, in a linear direction (as opposed to rotationally like an electric motor).

*Mechanical Actuators*

Converts rotary motion (for example from a control knob or handle) into a linear displacement via screws and/or gears, which is directly fixed to the control knob or handle.

\(^{12}\) Bullivant, *Responsive Environments: Architecture, Art and Design*, 8
Hydraulic Actuators

Consist of a hollow cylinder having a piston inserted into it. The two sides of the piston are alternatively pressurized/de-pressurized to achieve controlled and accurate linear displacement of the piston. The entity in which needs to be moved, is connected to the other end of the piston – the resulting effect being the entity also being displaced in the same direction as the piston.

Piezoelectrics Actuators

A property of certain materials in which application of a voltage to the material causes it to expand. These materials exhibit ‘hysteresis’ (where the physical change lags behind changes in the effect causing it), making it difficult to control their expansion in a repeatable manner.

Pneumatic Actuators

Converts energy (which is in the form of compressed air) into motion. This motion can be either linear or rotary. The unit consists of a piston, cylinder and air valves. Covered by a diaphragm, it keeps the air in the upper portion of the cylinder, which allows the air pressure to force the diaphragm downward, moving the piston underneath.
The production of these smart ubiquitous devices described above, for high volume commercial use, is becoming easier to access. As these devices become increasingly inexpensive, it has become possible to use them in the building industry for open-ended experiments, making the proposal of this new breed of architecture much less of a gamble in the sense of production costs. However, spaces embedded with such devices that subtly reconfigure themselves according to their occupants and their environmental stimuli, have the potential to “cause paranoia or delight, depending on how intelligently they are integrated into the design”\(^{13}\). This suggests correct selection of actuator devices is an important element of responsive architecture.

-Dynamism and Feedback

By overlaying responsive devices with physical spaces, we create new environmental entities, which challenge the perception of our world. “Learning flows in a two-way relationship between subject and context”\(^{14}\) and the ability of ubiquitous devices to adapt the site-specific space and its respective users, ultimately guides their learning and experience.

\(^{13}\) McCullough, \textit{Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing}, 85

\(^{14}\) Ibid., 127
Therefore, as we gradually shift away from simple models of space, time, and rationality, and developments in responsive environments begin to come to the forefront, feedback becomes a tool for use within architecture. As McCullough illustrates, “…as a mechanism, architects discovered that feedback could be incorporated directly into buildings via the use of responsive systems, and that these systems would enable spaces and people to enter into a dynamic relationship”\textsuperscript{15}. Rather than defying the evolution of today’s technology, “the use of digital techniques, technologies, and sensors, bring architecture literally closer to media by transforming it into a real-time medium”\textsuperscript{16}. This has been one method used by architects to compensate for the marginalisation of architecture as a cultural activity. ‘D-Tower’, an installation and website by Lars Spuybroek in the Netherlands, is a public artwork with its own website. It is zoomorphic in nature, and is used as a medium to abstract the emotions of the city by asking citizens to respond to a questionnaire through it’s related website – primarily about the intensity of their feelings about love, hate, happiness and fear. The tower converted the emotions into colour, transmitting ‘the state of the town’ every evening – the colour of the most intensely felt emotion. D-Tower is a lucid hybrid of different media, where architecture is part of a larger interactive system of relationships. It is a project where feedback as a tool is used to allow intensive feelings and extensive space to start exchanging roles.


\textsuperscript{16} Bullivant, Responsive Environments: Architecture, Art and Design, 9
Atmosphere brings with it an elusive, but compelling resonance. It is this attribute which marks places out from the everyday or the banal in contemporary life, and that gives them emotional meaning and human connection. As Castle explains, “most often it is historic spaces that are described as atmospheric, evoking with their accumulated traces of human occupation and activity of a bygone era”\textsuperscript{17}. Feedback, as an architectural tool, has the potential to evolve architecture into something atmospheric, becoming more site-specific in its interactivity. ‘Light Brix’ lighting system, designed by the HeHe Association in Italy, is co-run by Helen Evans and Heiko Hansen. It is a wall comprised of a series of lamps, and when touched, each lamp gradually turns on or off, inviting people to draw or imprint their mark onto the space. Here, HeHe borrow a common visual language within everyday life, and abstract it to form new concepts within the digital realm of architecture. The next visitors experience the state left by previous ones, and thus the ambience slowly evolves with each successive visit.

\textsuperscript{17} Helen Castle, “Interior Atmospheres : Editorial,” \textit{Architectural Design} (Artmedia Press) 78, no. 3 (May/June 2008), 5
CEMETERY ARCHITECTURE

Places where the dead are commemorated or evoked in the modern world, for the most part, leave a lot to be desired. They are complex spaces as they are not only places for commemoration or a transit place for brief visits, but they are also a place for pausing and reflecting. Many modern cemeteries seem to have been caught up in the technological phenomenon, and in turn, have been designed in the spirit of mass production. They lack the ability to inspire spirituality, yet they most undoubtedly accommodate the latest grass-cutting machinery. Unless we extend these technologies to cemetery architecture, there is a “real danger of creating cities without memory - cities in denial of death and humanity”\textsuperscript{18}. It is important to remember, these landscapes of the dead, are simultaneously for the living. These boundaries in space, time, and meaning, give a cemetery its salience and emotional power. Our subconscious has the ability to sense that we too, are destined for death, and this “ultimate

\textsuperscript{18} Worpole, Last Landscapes, 30
form of phenomenological awareness is constant in our perception of the world” 19 – it’s embodied within us, like a fatal flaw.

History of Cemetery Architecture

As it stands, Christianity in Europe had its beginnings, quite literally, as an underground religion. When the religion surfaced and they were able to build churches above ground, they established themselves in the civil world as a religion through their architecture. In order to sanctify their space and induce its sacred qualities, they began to build their churches above the graves of martyrs and saints. In turn, the space beneath the church became the burial space with means and importance. Through this protocol, the “church itself became to some extent an expression of the architecture of the dead” 20. The notion of a cemetery eventuated as once the space underneath the church was exhausted, burials began to extend outside, and from this, a hierarchy was inaugurated. The best spaces inside the church were reserved for the wealthy, spaces near the church for

19 Ibid, 21
20 Heathcote, Monument Builders, 15
emergent middle classes, and the spaces on the peripheries were communal graves for the poor. This point in the history of cemetery architecture solidifies the great importance held for the conception of shadow. The oldest and most sought after burial spaces were on the south side of the church, while the poorer were situated on the northern side where the shadow of the church fell upon them. Here, we see the first connotation of shadow being described as something to be feared – the void and the darkness.

In the seventeenth century, fundamental changes arose in the outlook and attitudes towards cemetery design as it stood. London, in particular, had growing numbers of people opposing the heavy costs of established church fees, so they began to create their own cemeteries. Once again, status and wealth had a determining factor on the interment of the dead. Death tolls rose, inflicted by the Black Death which didn’t leave Europe until the nineteenth century, and the demand for new burial grounds away from the already established church graveyards intensified. The tradition of the cemetery wall became prevalent due to “anthropological reasons to do with creating boundaries between polluted and unpolluted space”21. The notion of hygiene and an effort to move cemeteries away from the city centres, “arguably led to the disassociation of death from the heart of the urban fabric and the destruction of a layer of history and consciousness”22.

21 Worpole, Last Landscapes, 71
22 Heathcote, Monument Builders, 12
Following the devastating plagues that swept through Europe, the second half of the twentieth century saw a rise in cremation. Not only was it cheaper, but it also “saved the living in many towns from being outnumbered by the corpses of the dead”\(^\text{23}\). During this time, Europeans were beginning to embark on programmes of colonisation across continents, resulting in a great cross-fertilisation of cultures. In particular, they were in great admiration of Islamic memorials erected to contain the bodies of prophets and sultans. One of the most influential buildings of its time, the Taj Mahal in Agra, India (1630-53), was exuberant of exquisite gardens surrounded by canals, pavilions and fountains. Although the lives of the early colonists were luxurious, they were short lived. “The intemperate climates and their susceptibility to tropical diseases…”\(^\text{24}\) meant within a brief period of time, there was an extreme demand for a great number of burial places. Influenced by local traditions, some of the grandest garden cemeteries were erected amidst the colonies - notably, in 1767, a British colonial cemetery begun on South Park Street, Calcutta. Back in Europe, “there was a subtle erosion of the church’s influence”\(^\text{25}\). This was in part due to the rise of the belief of the \textit{individual} in society during the renaissance. The fundamental change in conception saw the creation of a new type - the memorial. The memorial became a vehicle for artistic expression and expression of wealth. Nothing exaggerates this more than Boullee’s Cenotaph for Newton, 1784. As Heathcote describes, “the building is no longer a representation of the earth but of the cosmos, and it’s a

\(^{23}\) Ibid., 22
\(^{24}\) Ibid., 16
\(^{25}\) Ibid., 17
monument to Newton’s ideas, to his mind more than his body which is absent”26. Critics pinpoint problems associated with monumentalism however, observing the “extent to which we encourage monuments to do our memory-work for us, we become more forgetful”27. However it is hard to refute that inscription, playing a big part in delineating the deceased of a monument, firmly establishes a message to the future. They cement the idea of cemeteries functioning as libraries of past lives and beliefs.28 The discovery of Pompeii in 1748 exerted a profound effect on western civilisation. “It was a museum before there were museums, a walk into a tangible past, back into a scared time”29. When it was exposed and excavated, it became a true necropolis – a city of dead people. However, this necropolis wasn’t set apart on the outskirts of the city, but rather it was a crucial counterpoint for the living. The Pompeiian necropolis was built in common with other Roman examples, along the roads leading to the city gates. This was known as *pomerium* – a zone, which acted as a metaphysical, rather than a physical, boundary that had the power to deter ‘aliens’.

26 Ibid., 11  
27 Worpole, *Last Landscapes: The Architecture of the Cemetery in the West*, 190  
28 Ibid., 11  
29 Heathcote, *Monument Builders*, 17
As perceptions of death became ever more inviolable, modern architecture steered away from the traditional methods of construction. The importance of the wall was a distinct departure from architecture of the modernist movement, which as a practice downplayed the wall in the 1920’s. Le Corbusier, one of many pioneering architects of the time, in his ‘five points’ statement of 1926, distinguished a structural system that “carried the intermediate ceilings and rose up to the roof, and the interior walls which no longer supported the other elements of the building, and where henceforth regarded as a membrane to be placed with total freedom wherever they were needed”\textsuperscript{30}. The principle not only took with it the walls load-bearing qualities, but it also deprived it of its association with the earth, our origins.

Aside from these modern architectural prejudices, there are notable exceptions that illustrate an attempt to show the results when the importance of architecture of the dead is realised at the end of the twentieth century. These precedents are commented on further into the design process, however, it is at this point that we must consider how the evolution of perceptions about death, have subsequently influenced the cemetery architecture of today.

MODERN PERCEPTIONS OF DEATH

“...Death is an essential feature of the human condition that requires people to develop means of coping with it...to neglect death is to ignore one of the few universal parameters in which social and individual life is constructed.”

Although the constructions of meaning around death vary within and across cultures, it is a biological fact that all human beings inevitably die. Heidegger remarked, “life juts out into death, yet it is equally true that death juts out into life”

The death we experience presently may have little in common with the death experienced

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previously”33, and while it is a universal human experience, the response it elicits is shaped by the attitudes that are prevalent in a given culture.

“A death system teaches us what to think about death, how to feel about it and what to do in regard to it”34. These systems include components of belief, emotion, and behaviour, which develop out of interplay between individuals and their cultural environment. Noting that culture is dynamic, not static, our perceptions have evolved, and we now live in a societal condition where we are in denial of death. Mourners are left feeling confused with the lack of definite, prescribed rites of mourning, and this “lack of clarity about what to do in the face of death…is a shift towards an informality characteristic of contemporary societies”35. The experience of death has become increasingly privatised, and the “progressive shrinkage of the scope of the sacred in western culture”36, alongside the medicalisation and self-identity obsession of modern times, has resulted in an architecture that mimics this societal denial of death.

33 Tracey McIntosh, "Death, Every Day," in Sociology of Everyday life in New Zealand (Palmerston North: Dunmore Press, 2001), 240
34 Ibid., 237
35 Mellor and Shilling, "Modernity, self-identity and the Sequestration of Death", 417
36 Ibid., 424
It is evident that humanity’s perception of death has evolved with time. Previously, it was not over-dramatised. By the twentieth century the perception of death, drastically altered by the Holocausts, had evolved from being universal and having a common destiny, to the view of death as a personal biography. The modern funeral industry established mourning clothes, vehicles and rituals of grieving, yet it had the inability to address death because of the dramatic medicalisation of it.

Denial of Death

We encounter death every day of our lives, yet most of these encounters are integrated so much into our daily routine, that we don’t even recognise them for what they are. Death, for the most part, has become a spectator sport. “This is not to argue that pleasure is extracted from watching this endless spectacle, but the evening news complete with its daily dose of death is absorbing while appalling”37. Apart from when we personally lose significant others to death, the death lessons of modern individuals are essentially gained from television, cinema and the newspaper. This could be due to the idea that “a preoccupation with mortality…is unlikely to be seen as

37 McIntosh, “Death, Every Day”, 235
legitimate – indeed, it is likely to be viewed as at best a morbid curiosity, and at worst as a manifestation of a serious psychiatric disorder”38.

Medicalisation is a particularly significant manifestation of the denial of death. With the shift from the social body to the individual body concerning death, focus shifted to the contemporary desire to hide deaths experience and organisation away from the public domain. “The removal of death and dying from the community and its relocation in the hospital or similar institution…”39, is suggestive that it provides people with a form of relief, that with not knowing how to deal with death, they are able to leave the dying in the hands of specialists. This vulnerability in the face of death is captured by our reluctance to come into contact with the dying, as we are “unable to confront the reality of our own inevitable deaths”40. Science has simultaneously given people the possibility of increasing control over their lives, however, “it fails to provide values to guide lives”41. With the framework of how to deal with the idea of death diminishing, we see people seeking to deny death through engaging in projects to ensure the survival and health of their bodies, in an attempt to avoid confrontation with it.

38 Ibid., 236
39 Ibid., 244
40 Mellor and Shilling, "Modernity, self-identity and the Sequestration of Death", 417
41 Ibid., 413
“In a society dominated by the values of youthfulness and vitality, death has become an embarrassment, rather than an ever-present facet of daily existence”\textsuperscript{42}. While it is reasonable to assume that human beings have always feared death, in modern society this takes on a new intensity where the space once occupied by religion and the sacred has shrunk, and we are more interested in prizing the youth and the future than in posterity. The prospect of death cannot be contained easily within this modern context because it represents no future in a culture oriented towards the future.

The modern reluctance to come into contact with the dying, the medicalisation of death, and the cultural orientation towards values associated with youth, have left laying bare the basic human anxiety of the unknown. The once public event became private. Dying was hidden from the public’s view, and the deathbed was moved from home to the hospital. It is here where architecture has assisted the perceptions of death, as well as funeral services, in becoming more discrete. Current models of crematoriums promote little contact with the dead. They offer services such as transportation from hospitals or funeral homes directly to the crematorium, as where “many cultures had previously attended to the body at home…in New Zealand this is an uncommon practice”\textsuperscript{43}. The finality of the committal when the chapel service has concluded, signifies the stage at which the coffin descends into the ground, and is taken away to the crematorium, or alternatively, disappears behind a curtain at

\begin{itemize}
  \item \textsuperscript{42} Ibid., 418
  \item \textsuperscript{43} McIntosh, “Death, Every Day”, 238
\end{itemize}
the back of the chapel. At this point family members are increasingly given the opportunity to either have a family member help the casket into the furnace, or watch the proceedings from behind a glass window—however, the process is then very much completed without any connection between the deceased and the bereaved. It is this weakened connection during the cremation process that leads to my belief that architecture has the potential to work harder, to re-engage the bereaved not only with their lost loved one, but also to the reality of death.
Sensitive to the idea that powerful and potent emotions are stirred while inhabiting these cemetery buildings, responsive environments have the ability to inject and enhance these experiences in a more positive light. Invading our lives, they have extended the possibilities of connecting remote environments, and have fundamentally affected the identity of our public, corporate, retail, and more specifically, cultural spaces.

In order for the idea of this dynamic and interactive new type of architecture to be integrated into a space renowned to be of quality where pausing and reflecting takes ownership, the responsive technology must respond to something site and programme specific. This ensures “the immediate qualities of the space are enhanced, and placed in an extended media context of adaptive content”44, and the building ceases to become

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44 Tobi Schneidler, “Mediating Devices for a Social Statement,” *Architectural Design* (Wiley Publishers), 75
described as somewhat of a spectacle. Another important aspect of trying to merge these two antagonistic agendas, is addressing this paradox of programmability. Few of us want our experiences pre-digested and we must be careful the “‘ideology’ of technology – its implicit assumptions about the way we should live – does not come to dominate our traditional culture, and in particular, the way we relate to the natural and built environment around us”\(^{45}\). To some extent, because architecture of the dead in the modern sense has been somewhat denied, there is no clear cut framework as to what exactly our ‘traditional culture’ embodies. The cross-fertilisation of cultures and the evolution of our perception on death, has in turn produced mixed ideas of how to and in what fashion we should honour the dead. While this does open up a window of opportunity for responsive architecture, for it to be effective, its “extensibility must be casual…the technology cannot place too much burden on its users”\(^{46}\).

We mostly visit these places at times of distress or upheaval, and it is almost impossible to not be overcome by the range of emotions that occur there, and nowhere else in the spaces of the city. Loss is an inevitable part of living, and grief is a natural response to this. So it is evident that cemetery architecture needs to address this idea

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\(^{46}\) McCullough, *Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing*, 114
of comfort with sympathy, and to generate spaces that create “uplifting surroundings to allow us to lower our defenses”47, and open ourselves up to these powerful yet healing emotions.

Successful grieving takes work, and one way many find landscapes of the dead useful in this process, is by their ability to allow us to reconnect and talk to them – i.e to say the things you never got around to saying in life. In this way, “the landscapes of the dead also act as confessional spaces, places in which the living can communicate with those who have gone before”48. This verbal banter between the living and the metaphysical idea of the deceased through the earth, places much importance on listening and sound in the experience of cemetery buildings. So it became a natural selection that these ubiquitous devices would respond to sound.

47 Christopher Day, Spirit Place (Kent: Gray Publishing, 2002), 22
48 Worpole, Last Landscapes : The Architecture of the Cemetery in the West, 159
“We shape our buildings, and afterwards our buildings shape us”

- Winston Churchill

“Sensing spatial attributes does not require special skills – all human beings do it”\textsuperscript{49}. It is hardwired as part of our genetic inheritance. Where the idea of ‘spaces speaking’ and pervasive computing are at crossroads, is in their dynamic qualities. Pervasive computing introduces this dynamic quality through sensors and actuators, providing architecture with an opportunity to evolve from its traditionally static stature, to become something more responsive to its environment. Aural architecture is a bi-product of dynamism in that an entire environment complete with memories and emotions can come alive solely through sound. Blesser and Salter describe all

\textsuperscript{49} Blesser and Salter, \textit{Spaces Speak, Are You Listening?} (Cambridge: The MIT Press, 2007), 1
sounds as “…the result of dynamic action, periodic vibrations, sudden impacts, or oscillatory resonances…”\(^50\). Therefore, soundscapes are alive by definition; they can never be static. They respond to human presence, much like sensors, in a dynamic, reactive, and enveloping way. For example, this is expressed through the concept of *mimicry*. The environment responds as if it were a partner in an auditory dialogue -

“Snap your fingers, and the space responds. Whistle a note, and the space returns one or more echoes. Sing a song, and the space emphasises particular pitches. Remain silent, and the space remains silent”\(^51\).

Typically, once built, the spatial design of aural architecture is relatively static and inflexible – “Only the occupants remain free to change their arenas by modifying their social and sonic behaviour”\(^52\). However, by proposing that the ubiquitous devices respond to specific site and programmatic sounds, responsive architecture is providing these aural arenas an opportunity to extend the idea of adaption and dynamism to enhance and “induce such feelings as…contemplative tranquillity, heightened arousal, or a harmonious and mystical connection to the cosmos”\(^53\).

\(^50\) Ibid., 15  
\(^51\) Ibid., 16  
\(^52\) Ibid., 24  
\(^53\) Ibid., 5
My initial response to deciding what type of sound these devices would respond to in the cemetery buildings, was to look at how I could sense a particular force of nature that was site specific, and inject a ‘new’ sound using ubiquitous devices, which would create a comforting, reflective atmosphere for the space. However I began to realise that architecture was capable of more than that. The architecture would stand to become just a “fixed form for the flows of ubiquitous computing”54, and not enhance it any way, except maybe contain it.

Looking at funerary architecture, the spaces themselves generate their own sounds. It seems I have been trying to inject sound with inspiration from a different source, when the sound of the actual users from inside the space (the mourners), and the sounds of the exterior environment (the landscape that surrounds the site), are all entirely relevant. Spaces literally ‘speak’, depending on how we treat form and materiality, so it seemed only natural that I find a remedy to enhance this. So I decided the sound that will be sensed by ubiquitous devices employed in the building would be the sounds of a chapel service – the footsteps of the pallbearers procession into the chapel, the quiet sobs of mourners, the speeches of remembrance, the cohesion of singing, and the finality of the committal.

The next question then becomes, ‘what architectural element will respond to this idea of sensed sound?

54 McCullough, Digital Ground : Architecture, Pervasive Computing, and Environmental Knowing, 64
SKIN

“Skin is both living and dead…a material whose exterior is senseless and inert while its inner layers are flush with nerves, glands, and capillaries”55. This convergence of life and death concerning skin structures our relationship to the object world, much like cemetery buildings do. Connotations associated with cemetery architecture and the ‘cycle of life’ are induced in the idea that skin, hair and nails are continuously sloughed off and renewed. Furthermore, skin provides the interface by which the body controls its internal environment, much like the skin of a building acts. So it became apparent that what building element was going to respond to sound, would be the building skin.

55 Ellen Lupton, Skin : Surface Substance and Design (New York: Princeton Architectural Press, 2002), 29
Skin, “...a knowledge gathering device...”\textsuperscript{56}, has the ability to act as a canvas on which we can watch the body’s amazing ability to communicate emotional and physical states. It differentiates itself across the body depending on its function – ‘thick-skinned soles’ is the result of a build up of dead skin cells in response to mechanical stress. Other areas, such as the skin under the eye, are much thinner and therefore more permeable to show colour changes in blood circulation (dark bags) and puffiness when we are tired. This change in permeability is of great interest in its application to cemetery architecture, and it is here where I began to formally work in creating a ‘skin’ which responds to the sounds of a chapel service. This concept has many implications directly related to architectural façade systems, as it explores ideas of change in perception for the viewer, light filtration and air flow.

As skin has the ability to communicate emotional and physical states, I propose that a responsive building skin could become an extension of that, only rather than communicating the individuals emotional state – which would have ethical implications – it responds to a common accumulation of sensed ceremony sounds.

\textsuperscript{56} Ibid.
Design process of the ‘skin’

My design process of the skin began with the image of dissolution. It is an image of paint peeling off a surface over time, where the material begins to diminish ever so slightly and depart from its marriage with its posterior...
surface. Not only did the image aesthetically please me, but it also had nuances of the idea “nature is based on
growth and entropy, proliferation, but also on dissolution and decay”\textsuperscript{57}.

My first conceptual model was an interpretation of the images and an effort to translate them into something
more spatial. Using strips of thin paper, with differing widths and lengths, I layered and glued each individual

\textsuperscript{57} Worpole, \textit{Last Landscapes: The Architecture of the Cemetery in the West}, 13
piece of paper on top and beside each other, working from one end of the model across to the other. One end of each strip was entirely fixed to the base of the model, however I allowed the other end to curl up, mimicking the dissolution portrayed in the set of images. During this process, and as I progressed my way across the model base, I discovered there were two different types of ‘curl’ conditions:

-1. Two-point curve

The two-point curve describes a piece of paper that is fixed at one end, and curls up at both corners.
-2. One-Point curve

The one-point curve describes a piece of paper that is fixed at one end, and curls up at one corner at the other end.

These two different curl conditions allowed me to create an opening (likened to a ‘wound’) between where the curling components of paper met at opposite sides. Where the paper was a two-point curl, the overall opening created remained either horizontal or vertical. Where the one-point paper curl was employed, it allowed the opening to curve upwards or downwards. This gave the model its overall organic ‘swooping’ effect.
I realised that this technique of layering directly on top of each other, posed a problem in terms of the idea of *permeability*. This ‘laminate’ way of working meant that the only area where light, air and view could penetrate the surface, was through the crevice created by where the paper curl components met. This was problematic as it would result in direct light, view and airflow through the one crevice, as opposed to it being filtered across the whole model.

In order to make the skin more permeable to the exterior environment, the next conceptual model was created using a grid technique. Firstly, I transformed the base of the model into a grid. I then created the same curl
components but rather than laminating each paper component horizontally on top of each other, I fixed each end of the component vertically back onto the grid structure. This ensured that each component was still able to curl, however light could pass through the model in varying gradients, according to the degree in which the paper curl was curling and the direction of the light source. The varying degrees of curls meant in areas of the model where the curls were curling at a higher degree, less light passed between them. This, therefore, made the ‘skin’ appear more dense. Areas where the curls weren’t so pronounced, meant light was able to pass between them more freely, resulting in the ‘skin’ appearing more transparent.
Using the computer modelling programme Autodesk Revit, I then sought to realise the model and create a process in which I was able to build the model and 3D print it. Essentially, this process implicated the idea of connection details and structure, ensuring these issues were considered to allow the model to be printed and be structurally sound.

**Application of Pervasive Computing**

In my investigation of actuator technology, I initially pursued pneumatic actuators. ‘Aegis Hyposurface’ by dECOi, Birmingham, UK, was designed in a competition for an interactive artwork for the foyer of The Birmingham Hippodrome Theatre. The piece is a facetted metallic surface that has the potential to deform physically in response to electronic stimuli from the environment (movement, sound, light etc). A bed of 896 pneumatic pistons drives the artwork, and the dynamic ‘terrains’ are generated as real-time calculations.

Using this as a precedent, I contacted SMC Pneumatics and introduced them to my concept. After deliberation with their creative engineer, it became apparent that the most efficient way of using their technology, would not
allow the components to literally curl from a straight position, but rather move back and forth, and tilt up and down.

Using pneumatic actuators in any type of application comes at a great cost. When proposing to use them to drive hundreds of singular components, it becomes far too expensive to drive each component singularly, even if it is possible. So the idea was that one pneumatic air piston, would control ‘x’ amount of curl components (the ‘x’ value would increase or decrease, depending on the area I wanted to affect at one time).
The components were proposed to be made out of a malleable rubber, in which they were all attached to each other at their ends by a thin wire (Figure 1 and 2). They would sit inside metal sleeves, which would then be attached back to the structure of the wall. These sleeves are what gave the components rigidity so they remained suspended perpendicular to the wall surface. A pneumatic piston was then attached directly behind and onto the centre of one curl component within the group (Figure 2). This network of pistons and air valves would sit in the wall sandwich between the interior space the skin was affecting, and the exterior façade. When the piston receives the input from the sensor, it drives the component it is attached to either forward or back, up or down, and in effect, the whole group that the particular component is attached to will move accordingly. Because each component is made of a malleable material, when the piston actuates a movement, the other components stretch and deform in the same direction, creating an overall curvature throughout the façade. In this way, the same type of effect is gained (varying thicknesses across the skin) that would otherwise have been created if the components curled rather than stretched.

Although theoretically this type of technology could have been executed for this scheme, further research into the area proved that it was not the best application for the architectural effect I was seeking. Firstly, the network of devices required to sense and actuate the skin, would produce far too much noise, a far cry from the muteness I was looking to achieve. Secondly, the depth of the pistons and their air valves would have meant that the wall cavity, in which this building skin system required, would increase dramatically. This was problematic as it
ultimately increased the amount of structure that view, light, and air, had to pass through to reach the interior spaces. Enabling this system to gain site and programme specificity, the skin’s permeability is something that could not be sacrificed – “sometimes when you are grieving, you need a bit of relief – to be able to look out and see sun, landscape and water”\textsuperscript{58}, and the network of structure required for the operation of pneumatic actuators would have been detrimental to this.

It became apparent that a device with more subtlety would be better suited for this type of application – for a space that was heavily subdued and needed to prescribe an agenda of pausing and reflecting.

\textbf{Piezoelectrics}

The term “piezo” is derived from the Greek word for pressure. In 1880 Jacques and Pierre Curie discovered that an electric potential could be generated by applying pressure to quartz crystals; they named this phenomenon the “piezo effect”. Later, they ascertained that, when exposed to an electric potential, piezoelectric materials change

\textsuperscript{58} George I. Engle, “Grief and Grieving,” \textit{The American Journal of Nursing} (Lippincott Williams & Wilkins) 64, no. 9 (1964): 93-98, 15
shape. This they named the “inverse piezo effect”. Piezoelectric actuators are transducers that convert electrical energy into a mechanical displacement or stress using a piezoelectric effect. One reason as to why they are a more efficient device for the application in a responsive skin, is that it can “…perform sub-nanometer moves at high frequencies because they derive their motion from solid-state crystalline effects…”\textsuperscript{59} – in other words, they have no rotating or sliding parts to cause friction. They have the ability to provide a minor change in state, without a noisy network of structural components.

Bender Type Actuators consist of a passive metal substrate glued to a piezoceramic strip. A piezo bimorph reacts to voltage changes the way the bimetallic strip in a thermostat reacts to temperature changes. “When the ceramic is energized it contracts or expands proportional to the applied voltage. Since the metal substrate does not change its length, a deflection proportional to the applied voltage occurs”\textsuperscript{60}. They require little to no maintenance and are not subject to wear because the have no moving parts in the classical sense of the term. Again this addresses the problem of programmability in a more positive light, as we “have neither the time to program so many systems ourselves nor the willingness to accept how others might program them for us”\textsuperscript{61}.

\textsuperscript{60} Ibid
\textsuperscript{61} McCullough, Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing, 17
Each metal component is fitted with a thick, white fabric sock. This not only softens the materiality of hundreds of metal fin components against the cold concrete, but acoustically provides the space with absorption of reverberation. The fabric consists of a two-way stretch, allowing the Piezo element full range of motion without restriction. If there were slight friction or restriction placed on the device by the fabric, the piezo bender actuator would still provide movement, as there aren’t any loads being placed on them anyway, as they would have normally.
CHAPTER SIX

FORMAL DESIGN WORK AND METHODS

Site Analysis
The chosen existing site in the North Shore City region is O’Neill’s Point Cemetery on Bayswater Avenue, Bayswater. The land at O’Neill’s Point Cemetery was bought from the O’Neill’s family in June 1980, and currently stands as North Shore City’s oldest cemetery. Designed by John Boyland, it opened in 1891, and was originally divided into three areas – non-sectarian, Anglican and Roman Catholic. However, it is no longer defined by these categories in any way.

The site had many attributes when considering the aptness of the proposal for the scheme. Firstly, there are no current cemetery buildings on site, meaning there was no need for consideration of existing buildings. Secondly, interments may still be carried out, providing an opportunity for the cemetery buildings to cater for both cremations and burials – although the buildings would be primarily used for cremations.

The current site is 60,000 m². It has an existing road, which runs perpendicular to Bayswater Ave, and penetrates the site centrally between the two existing burial grounds on either side (Refer to dotted lines above on site map). The site has a natural contour that slopes down towards the northern boundary of the site which is the waters edge, and marshy in nature. Where the site extends further into the water, much like a peninsula does, an existing footbridge connects the O’Neill’s Point Cemetery to the southern end of Eversleigh Road. This road at its beginning, has a connection to Lake Road – that being the main road used to enter Takapuna City from Devonport. This provides runners and walkers with a route that exposes them to the cemetery, as well providing
a journey that exploits the transition between solid grounds and the suspension of being above the shifting sea. This connection to water for the cemetery becomes an important one, as “in the Buddhist story of creation, water was the first element to come into the world”⁶². It is a powerful idea that water, the originator of all things living in this world, is present and has a direct relationship with the land that then reclaims the dead and sends them into their next phase of life. Present is the idea of the ‘cycle of life’, where the beginning and the end are not defined in a linear way, but rather as a continuation of one another.

At the end of the existing cemetery road, where it folds and turns in on itself to provide a way out, the site changes from a gradual slope to a dramatic fall. The contours become tighter at this point, as if the site is being pinched in to draw the water even closer to the existing gravesites. In turn, it provided an area of the site that suggested cemetery buildings could tuck in against the natural ‘wall’ that the contours are creating, and make them appear more discrete, not taking away the drama and importance of the existing burial sites that already occupy the space.

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Conceptual Design - Reintroducing Sound to the Design Process

Having started my initial conceptual design using an image embodying *dissolution*, it provided a tool for creating a secondary ‘skin’ for inside the cemetery building spaces. However, I still lacked a design language for beginning to work with the site, and more specifically, the programme. I sought a way in which I could incorporate sound (which I had already identified earlier in the process as being a crucial sensorial aspect of cemetery architecture), and the programmatic idea of the ‘journey’.

The psychological shock and grief associated with the programme of these types of spaces make the idea of a spatial itinerary or journey, a vital issue. In these times of emotional distress, “…we need to coast, not decide”63. So this conception of a journey through spaces, amalgamated with the importance of sound in cemetery architecture, led to the idea of a *Sound Map Journey*.

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The ‘sound map journey’

It is apparent that the sounds experienced inside the chapel, are not the only sounds present in the entire experience of cemetery buildings. There is a real sequential journey of spaces and sounds that people endure during these times, and they all play a part in how feelings and emotions are stirred at each stage.

So I began a general timeline depicting how a journey of spaces would be experienced in sequential order:

-1. Journey/entrance to the cemetery buildings

While parking for close family and the disabled is provided near these buildings, the remainder of visitor parking is provided off-site on Bayswater Ave. Because the chosen area of the site to work within was closer to the northern boundary (nearer to the back of the site), the length of time that visitors would spend arriving at the cemetery buildings would be an extensive downhill walk.
-2. Chapel waiting area

Once the cemetery buildings are reached, the entrance of the chapel becomes an important sequential space. Often before a funerary service, there is an in-between stage of the process where entrance into the chapel isn’t yet permitted, however the arrival of mourners has begun. It also is a space where family and friends gather in groups before entering the chapel to be seated, so the service is experienced in proximity to common loved ones. In traditional terms, it could be described as the chapel foyer.

-3. Chapel service

There is then the time period that consists of the chapel service. At the completion of the service, the programme splits in two, where chapel visitors fold back in on themselves and exit the chapel the way they came in, and close family resume the journey to the next stage in the mourning process.

-4. Crematorium

The next stage in the mourning process becomes the crematorium, the time when the deceased are cremated and close family members say their final goodbyes as the interment process begins.
-5. Reception area

The reception area becomes a space that is inhabited after the chapel service for visiting mourners. It is a time where comfort and compassion can be given to those who were closest to the deceased, and often tea, coffee and refreshments are served. Close family then proceed to the reception area after they have said their final goodbyes in the crematorium space, and are reunited with friends and family.

I then made a list of the most prominent sounds that could potentially affect each/all of the spaces:
By obtaining MP3’s for each sound, I plugged them into a computer program, and by pressing ‘print screen’, I was able to capture the time/volume equaliser graphs for each individual sound over a given period of time. I then created a time line of the order that each space would be inhabited, and overlaid the image of each sound that was relevant to each particular space – that is, during the chapel service, quiet conversations would not be
heard, yet quiet sobbing would. Therefore, some sounds were not applicable to some spaces. This gave me an overall 'sound map journey', from which I could start to formally draw shapes and form from. A volume vs. time graph was utilised as opposed to a frequency/pitch vs. time graph. The sensors in the responsive skin will sense volume, not frequency or pitch.

Once the sound journey was established, analysis of the image saw that there were gradients in colour of the layered sound map – some areas were denser, symbolising a larger accumulation of sound, and other areas were more opaque. Along the line of the graph that represents '0' on the volume vs. time graph, there was a consistent
denser area that ran the length of the sound journey map, which occasionally had larger denser volumes branch off it. Starting at the beginning of the sound map journey, I began to connect the denser areas of the graph into larger volumes by drawing lines connecting their outer shaded areas, as though you would if you were drawing a line through a graph to calculate the mean value. This process created spaces in plan that branched off the central denser line, and quickly I began to develop sequential spaces that could be translated into cemetery buildings. However, they were still very much two-dimensional. In order to add scale to the forms, and transform them into three-dimensional spaces, I began to fold and slice the image. Not only did this folding give the larger spaces height, but also enabled the sound map to begin to inform not only the outer edges of a space in plan, but the depth of a space in section – this suggesting the utilisation of an underground or submerged building.

Refer to Appendix 1.

Once spaces were created in both plan and section by the use of folding and slicing the sound journey, I began to adapt them to the site. Once again, this gave the overall sequence of spaces scale. With the area of the site most appropriate for adding cemetery buildings already chosen, it was evident that the dense, long, linear section of the graph which extends from the beginning of the map, right through the chapel, and on towards the crematorium, had its beginnings by wrapping around the first contour of the slope before it dives down towards the more gradual sloping land by the waters edge. As it wraps around the contour, leading the larger volumes of
space around and tucking them into the side of the steeply contoured land, it is suggestive of creating a boundary wall for the spaces, which act in retaining the force of the land. By descending into the spaces from a higher contour on arrival, it drops the bulk of the cemetery buildings below the horizon line suggesting spaces that are partially submerged in the land, and therefore, maintaining views of the sea.

Refer to Appendix 2.
Once the sound map journey had been used to establish not only the general volumes of the buildings, but their sequential order in the process of funerary processions, I needed to construct a formal language of how I was then going to manipulate these volumes of space and make them more architectural.

In re-visiting the site, it became apparent that the existing gravestones held a powerful presence in the landscape of the O’Neill’s Point cemetery. In the same way that the early Roman cities had no substantial walls and that the presence of the necropolis along the roads leading to the cities was enough to deter aliens, the existing burial
grounds at O’Neill’s Point have the same effect. The existing cemetery lacks any boundary walls, like those seen in cemeteries such as the Tombs of Brion by Carlo Scarpa, and in many ways these burial grounds act as a metaphysical rather than physical boundary. In having such a formidable presence on the site, it would be a missed opportunity to not draw from them for a source of inspiration – to gain some kind of information about the cemeteries place, time, and nature. Walking amongst them and taking photographs, I stumbled across something that was appealing because it was a universal image that I had already acquired through iconography specific to graveyard architecture. It was familiar, yet it was simultaneously something entirely site specific and unique to O’Neill’s Point. It was the image of a tree’s root uplifting an existing gravestone, and in doing so, creating a pit or a void where parts of the gravestone had been uprooted, and a mound where the soil and other parts of the gravestone had been displaced. It was an image that I had seen time and time again, in fairytale illustrations and movie scenes set in graveyards, yet it was also unique. The inscription on the gravestone identified a person who once existed in this part of the world only–this image could never be replicated anywhere else in the world because the name, date and place inscribed in the stone was a fixed point in history that could never be taken back.
So this idea of ‘pit and mound’ topography became a powerful concept in my response to the site. This image not only provided me with the idea of this ‘disturbance of the dead’, but it reinforced the powerful notions of the hundreds of undisturbed existing ‘mounds’ that blanketed the rest of the site. I now had a way of formally influencing the forms I generated through the ‘sound map journey’, in a site specific and programmatic way.

Mound

“…When we find a mound in the woods, six feet long and three feet wide, raised to a pyramidal form by means of a spade, we become serious and something in us says: someone was buried here. That is architecture”64

- Adolf Loos

Adolf Loos recognised the power of the gesture – the body is buried in a pit, where the displaced soil is placed back over it, creating a mound – it is architecture at its most archetypal.

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64 Heathcote, Monument Builders, 9
This alternative idea of ‘mound’ in cemetery architecture results in two implications in consideration to my site. There is the first condition, where the mound is at its simplest form – the undisturbed tomb (memorialising the dead), and the second condition, where it becomes the displaced tomb due to the forces of nature (the implication of delineating the dead and its position in time).

The injection of these two separate meanings that result in a common formal expression of ‘mound’ - memorialisation and the implication of time due to natural forces - means that their programmatic adaptation to the design is important. The burial of the dead creates dynamic shapes and force fields in the inherited landscape, which “not only reconfigure our landscape, but our orientation to space and time”\textsuperscript{65}.

\textit{Pit}

The idea of the ‘pit’ becomes the result of the force of nature over time, causing a shift in the landscape, opening it up to the skies above.

\footnote{Worpole, \textit{Last Landscapes : The Architecture of the Cemetery in the West}, 18}
Pit and mound topography enables the differentiation of spaces within the cemetery journey. This provides a tool for architecture to manipulate and evoke certain feelings and emotions at different stages of the ceremonial process.

**Design Work**

Through the process of the ‘sound journey map’, a tool for generating a site specific spatial itinerary, I now had a rough idea where the building volumes were situated on site, and where potential entrances/pathways were located to the main chapel building and how vehicles entered and left the site. It was an important consideration, as I wanted to be as sensitive to the existing burial grounds as possible, leaving as much of the land free from built landforms. Entry into the site for the funeral hearse and immediate family parking is on the eastern site boundary off Bayswater Ave. Not only does this provide an entrance and exit, but it also acts as containment for the existing burial grounds it runs alongside, almost to assist the work they do in providing a ‘metaphysical boundary’ for the site. The road extends towards the water straight ahead, where visitors are led to the left, and the hearse is led to the beginning of the long descent for the coffin. View of the water is maintained at all times.
Funeral parking for the remainder of visiting mourners is located off site along Bayswater Avenue. Tadao Ando in his Forest of Tombs Museum in Kumamoto, 1992, “asks us to take enough time to descend into history”\textsuperscript{66}. Visitors, entering the site via the path that traces the vehicle entrance, a walk of some minutes, pass existing gravesites towards the chapel entrance. The hearse follows the same contour line as the coffin decent, pulling away from its edges slightly, and exits via the connection to the existing cemetery road running centrally between the existing burial sites.

\textit{-Coffin Entrance}

The coffin, followed by immediate family, begins its descent down a narrow pathway at the arrival level. Enric Miralles and Carme Pinos in their Igualada Cemetery in Spain, 1985-94, explore this idea of a ‘processional street’ that descends from the entrance, with the intention of leading the bereaved down into the landscape to a

\textsuperscript{66} Meijenfeldt, \textit{Below Ground Level : Creating New Spaces for Contemporary Architecture}, 99
‘city of the dead’\textsuperscript{67}. As the coffin descends deeper into the contour, the pathway acts as a boundary wall for the cemetery buildings on site, while simultaneously holding back the force of the earth. It could be said “that the walled cemetery presents a human response to the dangers of a hostile and predatory natural world, a place of retreat and sanctuary”\textsuperscript{68}. It also acts a transition space, where “sound absorption can subdivide a space into multiple sound arenas by creating virtual partitions”\textsuperscript{69}, quietening the atmosphere of everyday life and keeping out the chaos of the city.

With the descent’s view out towards the ocean, the pallbearer’s job is extended in time. As in Tadao Ando’s Church on the Water, the difficult and elongated process, physical as well as emotional, of the descent towards the chapel, “serves to emphasise the movement across the threshold from the outside into the sacred interior”\textsuperscript{70}. As the descent turns the corner, shifting the outward view from the sea and landscape to the entrance of the chapel, it moves underground and tucks under the contour it has just left. This shift marks the point at which we find earth as being the place of return. By erecting “faux caves that remove us from the rational structures of our

\begin{itemize}
\item \textsuperscript{67} Anatxu Zabalbeascoa, Igualada Cemetery: Barcelona, 1986–90 - Enric Miralles and Carme Pinos Architecture in Detail (Phaidon Press, 1996), 9
\item \textsuperscript{68} Worpole, Last Landscapes: The Architecture of the Cemetery in the West, 44
\item \textsuperscript{69} Blesser and Salter, Spaces Speak, Are You Listening?, 28
\item \textsuperscript{70} Drew, Church on the Water, Church of the Light: Tadao Ando, 18
\end{itemize}
everyday lives”\textsuperscript{71}, we prepare for a space of reconciliation where often in grief, “the living are forced to confront the mortality of others and ultimately themselves”\textsuperscript{72}.

The thick, heavy, concrete in-situ walls on either side create a hard, reflective space. Light infiltrates the underground corridor through indirect openings in the slanting, off-kilter roof above, washing down the boundary wall on the left and guiding pallbearers through the momentarily light deprived pathway. Slight changes in the tilt of the wall on the right, and pitch angles of the ceiling above, give the procession a sense of depth of the space, where light hits these slight variations in surface qualities. Carlo Scarpa in his Brion-Vega Cemetery in Italy, 1970-72, utilised this technique with “concrete walls edged with Scarpa’s original zigzag motif, and the gradations in light and shadow these edges create”\textsuperscript{73} (Refer to Figure 3.). The sudden enclosure and reflective qualities of the space serve to intensify the sound of the slow, heavy, and pronounced footsteps of the pallbearers and its procession. The echo becomes the “aural means by which we become aware of the wall and its properties”\textsuperscript{74}, while the thickness and proximity of the concrete wall is announced as “sound propagates

\begin{thebibliography}{99}
\bibitem{Betsky} Aaron Betsky, \textit{Landcrapers: Building with the Land} (London: Thames & Hudson, 2002), 58
\bibitem{Toy} Maggie Toy, ed., “Death in Venice,” \textit{Architectural Design} (John Wiley & Sons Limited) 70, no. 5 (October 2000), 46
\bibitem{Blesser} Blesser and Salter, \textit{Spaces Speak, Are You Listening?}, 2
\end{thebibliography}
farthest in valleys, which act like sonic conduits\textsuperscript{75}. This aural quality of the architecture is what triggers a response from the responsive skin, now becoming apparent on the right of the corridor as the descent then pulls away again from under the contour.

\textsuperscript{75} Ibid., 30
At this point the coffin’s entrance and the chapel waiting area slide past each other, allowing light to infiltrate the passageway, and the overspill of mourning visitors a glimpse of the slowly moving hoisted coffin, and the bereaved that follow. As the sensed sound induces a reaction from the responsive skin - the dividing line between the dead and living - it begins to subtly curl. The heavy concrete roof that looks to have been displaced by the force of the procession below, then opens up to the landscape in which the heavy boundary wall is doing its upmost to keep out. Shallow pools of water above, contained by the boundary wall below, allow a small overflow of water to wash down the hard, rough, in-situ concrete surface. The introduction of this natural element is to connect the interior space with its surroundings beyond the boundaries of the land – what we can see from the space, yet not directly experience in the space. “Water is a universal landscape element…which can bring life”\textsuperscript{76} and has the “…strangest power to stimulate the imagination and to make us aware of life’s possibilities”\textsuperscript{77}. The force of this natural element creates a pit in which contains it, resulting in the suggestive idea that the coffins decent becomes congruent of the notion of the ‘mound’.

This seemingly raised pathway leads into the chapel where gradually, the full height of the chapel ceiling is revealed, and it is at this point that the idea of the mound becomes more distinct.


\textsuperscript{77} Kenneth Frampton, ”Corporeal Experience in the Architecture of Tadao Ando,” in \textit{Body and Building: Essays on the Changing Relation of Body and Architecture} (Massachusetts: Massachusetts Institute of Technology, 2002), 316
Visitor Entrance

The visitor entrance is marked not only by the footpath, but more importantly, by the only building visible on the site at the arrival. The narrow concrete path, white in colour compared to the road that runs alongside it, leads us across the hearse’s way out. To the left, the administration building - a seemingly lone, small, concrete in-situ block - appears to be sitting perched up on an extended piece of landscape overlooking the sea beyond. The extended landscape, slightly tilting away to the west, reveals a slice of the force that has seemingly tried to fight its way to the surface. The sculptural block, acts as a signifier to the way in. As evident in Boullee’s work in his Cenotaph for Newton, 1784, this idea of partially submerged elements, were an effort to “…reconnect the worlds above and below...suggestive of the earth reclaiming part of the living”.

Pools of water slip into the crevice formed between the two landscapes on the right, and directly ahead appears to be a puncture in the earth, where a shadowy staircase draws mourners in, and drops them into the chapel waiting space. Boullee’s Cenotaph manipulates light and shadow in a similar way - “…a bleak, black door seems to

78 Heathcote, Monument Builders, 23
Draw in the mourners like a magnet, or a black hole, the gravitational pull of which is too great to resist”⁷⁹. The walls on either side are in close proximity, and the heavy roof extends to follow the regression down into the space. Initially, the stairs begin their descent steeply, with steps slightly narrow in width and a touch higher in height. The visitor’s gaze is forced to shift towards the ground, ensuring that they don’t lose their step, extending into the dark void that runs along the edge where the stairs fall short of meeting the concrete wall on the left. With the accumulation of the strong, emotional force of entering mourners, a thin slice of light enters the narrow space due to the concrete wall on the right tilting away a few degrees, parting from its marriage with the concrete roof edge. As the visitor plunges closer to the chapel ground level, a wash of light enters the bottom of the dark corridor, and the stairs suddenly transform into shallow long steps, in which the steepness of descent is dramatically reduced. The visitor’s gaze then shifts from the ground and towards the light and views out to sea that is revealed in front of them.

⁷⁹ Ibid., 25
-Chapel Waiting Area

Once the visitor is squeezed out from the narrow opening of the staircase, they are expelled to a wide opening at the chapel ground level and into the space of the waiting area. Once again, they are exposed to the natural elements common of their journey into the cemetery space. As “the walled cemetery captures the architectural ambiguity of being both a walled room and an open space in the landscape” 80, shelter and exposure are at one and the same time. Ando exploits this idea of “traversing an open-air atrium, which necessarily entails being exposed to the elements for much of the year” 81 in his first house, the Azuma residence in Sumiyoshi, 1976. Contrary to the traditional embodiment of the chapel foyer as an interior space, it is alternatively an outdoor space in which mourners are able to absorb the sites views. Furthermore, it evokes a sense of time through the experience of seasonal elements - highly restricted in the staircase entrance. It is at this point that the coffin’s descent and the responsive skin become visible, acting as the dividing line between the spaces of the living and the dead. The outdoor waiting area provides the chapel with a spill over space, as the demands of mourning have evidently changed. The building needs to reflect this, as today’s funerals might involve any number of people, from one to two hundred; many are huge affairs.

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80 Worpole, Last Landscapes: The Architecture of the Cemetery in the West, 10
81 Frampton, "Corporeal Experience in the Architecture of Tadao Ando", 306
-Chapel

Visitors traverse their way towards the entrance of the chapel - an in-situ concrete volume on the left, offering a small opening along the western façade. They are squeezed through between a solid volume of concrete on the left, and a concrete wall on the right, and begin to descend down into the sunken space. As they penetrate the space further, the wall on the right morphs into a glass façade, sandwiched between a network of structural horizontal and vertical steel members, and as they spill into the chapel space, the responsive skin - the dividing line between the coffin entrance and the chapel waiting area - continues to penetrate the space on the left. The western façade channels mourners further into the ground by means of rows of sunken seating. Aisles between seating slope downwards and dig into the earth, as if the emotional force that mourners are exuding is responsible for this displacement as they make their way to their seats. It becomes evident that they are now seated on the same land that they were just minutes ago, standing on. This act of sinking further into the ground challenges the idea that “these worlds of the dead are separate worlds, self-contained worlds, which we view but cannot enter”82. Descending partially into the depths of the earth that our deceased loved ones are destined for – the ‘pit’ - provides not only a connection to the process they’re about to embark on, but “it might even be true

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82 Worpole, Last Landscapes: The Architecture of the Cemetery in the West, 70
that we aim to make many of our spaces into caves to create a sense of comfort…”\textsuperscript{83}. This occupation of a ‘pit’ during the chapel service appears to be the force that has resulted in the coffin pathway becoming resemblant to a ‘mound’ in which the coffin eventually comes to rest on during the chapel service, has symbolic references to the purpose of a tomb. “The purpose of the tomb is to demonstrate the continuing existence of the dead in the minds of the living…where the tomb is both a transitory resting place in which the body undergoes the beginnings of the journey to the next, more sacred world”\textsuperscript{84}. Likewise, the coffin has only come to rest at a temporary stage in the funerary itinerary. The eastern boundary wall retains the heavy earth of the existing burial grounds above. As water flows down the grounding wall from pools above, it diverges around the steel beams that embed themselves perpendicular to the concrete wall, and into the earth it retains beyond. It appears the force of the water falling from above has deformed the solid concrete roof that the anchoring steel beams are supporting, displacing the concrete edge that runs parallel to the falling water. This displacement allows light to penetrate the chapel space by washing down the load-bearing wall, illuminating and enhancing the idea of life that water brings. A trough contains the water at ground level by the “expansive freedom edged by the gradually shelving…”\textsuperscript{85} concrete mound – the coffin pathway. Ando, in his description on materiality, states “…when ‘I’

\textsuperscript{83} Betsky, Landscrapers: Building with the Land, 8
\textsuperscript{84} Heathcote, Monument Builders, 8
\textsuperscript{85} Woodward, Waterscapes: planning, Building and Designing with Water, 12
perceive the concrete to be something cold and hard, ‘I’ recognise the body as something warm and soft”86. This dynamic relationship between the body and its built environment is further enhanced by water, which in itself is a “fundamental soft element”87. “In temple architecture…so dilute is the light that no matter what the season on fair days or cloudy, morning, midday or evening, the pale, white glow scarcely varies”88. This in turn with the idea that the building is submerged into the side of the earth may induce a feeling that in this room you might lose all consciousness of the passage of time. To the left, the sound of heavy footsteps becomes apparent, announcing that the procession has begun. Visitors respond by turning to the left, and the responsive wall begins to subtly reconfigure in reaction to the sound of the pallbearers footsteps. The slow, rhythmical sight of the pallbearer’s footsteps, become slightly visible to the chapel as the skin begins to open. The responsive wall then comes to an end, disseminating the hoisted coffin, which is placed down on an elevated stand. At rest, its heavy force of presence drives the concrete roof above it towards the sky, “delivering light below and reflecting the sky

86 Frampton, “Corporeal Experience in the Architecture of Tadao Ando”, 305
87 Woodward, Waterscapes: planning, Building and Designing with Water, 12
88 Frampton, “Corporeal Experience in the Architecture of Tadao Ando”, 309
above”\textsuperscript{89}, suggestive that the coffin is momentarily, “released from the earthly environment, which allows contact with the celestial”\textsuperscript{90}. Where the roof extends vertically above the common roofline, it defines the upper portion of the concrete in-situ cross – “a secular icon of hope”\textsuperscript{91}. During the service where prayers and speeches are given in memory of the deceased, to the right of visitors along the western façade the grid of horizontal and vertical members sit cast into a heavy concrete and glass facade. Hundreds of curled ‘fins’ wrapped in heavy white fabric extend from the grid system on the exterior of the façade, hanging off the side of the building like a large white curtain. The angle at which the fins are orientated, permit little light into the interior space when visitors are seated, however when asked to stand and participate in singing, this ever so slightly changes. The angle of the fins that previously restricted light flow now sanctions a little a bit more. As the volume of sound begins to increase, subtly, the white fabric fins begin to curl in differing directions, dependant of the volume of sound in certain areas, gradually flooding the visitors in greater levels of light. The engagement of visitors singing, opens themselves up physically as well as emotionally, and the responsive skin almost mimics their actions by also opening and slowly revealing the exterior. The fins movements are minor and faint, however, the effect it has on the interior environment is much less discrete. As the singing comes to an end, and visitors are

\textsuperscript{89} Worpole, \textit{Last Landscapes: The Architecture of the Cemetery in the West}, 190
\textsuperscript{90} Meijenfeldt, \textit{Below Ground Level: Creating New Spaces for Contemporary Architecture}, 21
\textsuperscript{91} Worpole, \textit{Last Landscapes: The Architecture of the Cemetery in the West}, 42
once again seated, the responsive skin slowly returns back to its initial state - returning the interior quality of space back to its diluted quality of light. Typically in cemetery buildings, focus in the made environment is invariably on buildings. “We tend to undervalue nature, but in situations of acute stress, the greatest therapeutic influence is neither therapist nor buildings, but light and landscape”\textsuperscript{92}.

\textit{-Reception Area}

As the service comes to a close, and visitors are invited to view the coffin, they are made to turn and leave the way they entered, stirringly passing the long line of fellow mourners who are psychologically preparing themselves to say their final goodbye. Again they are forced out through the narrow entrance, and spill out into the exposed chapel waiting area. They then continue ahead, past the staircase entry on the right, and slip into a space that directly overlooks the landscape and the sea beyond.

\textsuperscript{92} Day, \textit{Spirit Place}, 233
The chapel slowly empties as mourners acknowledge the resting coffin, saying their final goodbyes, and offering condolences to immediate family standing at the front. Family members then re-hoist the coffin from its temporary position, and wait for the wall in front to recede back into the boundary wall on the left. Light filters through the gap between two concrete walls gradually, and as the coffin and family begin another descent, a kink in the architecture orientates them to the left. As they pass the slight opening, a glimpse of the existing gravesites beyond is visible, and they are drawn once again into a place of shadowy darkness. It is this play of light and shadow that leads the way of the mourners, as “light alone, does not make light. There must be darkness for light to become light – resplendent with dignity and power”93. As the procession continues into the small room of weakened light, the concrete wall on the right appears to tilt away slightly, allowing the room to open up to the sky above just a little, washing light down its rough in-situ wall. In times of these final moments, “psychological shock and grief…erode will and even life energies, sometimes to the point of being unable to stand”94, and as the in-situ wall tilts to allow the elemental qualities of nature in, it slightly bulges before reaching the ground - an effort to catch the bereaved in their moment of despair. A thin horizontal opening in the wall filters flickered

93 Frampton, “Corporeal Experience in the Architecture of Tadao Ando”, 317
94 Day, Spirit Place, 229
light into the space – suggestive of the fire that within minutes will consume the deceased – which is the resultant effect of the prevailing winds through the trees that line the exterior façade. The coffin is laid down, the committal takes place, and the descent begins and returns the deceased back to the earth, our place of origin.

-Crematorium roof garden

Once the coffin makes its descent into the deeper territory of the earth, mourners are lead around the corner and up into the crematorium roof garden. The garden, symbolic of the ‘mound’ created above the ‘pit’, exposes the two, tall, concrete chimneys of the furnaces below, revealing them behind the trees and shrubbery in the immediate foreground. To the right, a dark staircase descends into the mechanical workings of the crematorium, offering an opportunity for a family member to help the coffin into its final stage of the journey. A small staircase tucked in under the earth of the contour above and between the chimney on the right, leads up into a space nestled between the two concrete chimneys. The tall, concrete structures lean away from one another slightly; with timber slatted seating embedded into the concrete ground and the chimneys sides. Here, as the smoke begins to escape from their tops, mourners are able to feel the heat on their backs, as the sun pours in between the tall twin structures.
Below, a small alcove sits embedded into the large concrete base of the chimneys, offering a small, “quiet haven to allow rest and recover”\textsuperscript{95}. As the bereaved inhabit the space over the period of time that the cremation takes place, emotions can subside from grief and distraught, and often mourners begin their healing process by talking – amongst family or themselves – saying the things they never got to say. The alcove acts as an echo chamber, where conversations between the dead and alive are continued.

\textit{-Crematorium}

The crematorium is situated underground directly below the roof garden, where as Ando describes in his Forest of Tombs Museum in Kumamoto, 1992, there is an attempt to “connect past and present, with the ground level as the dividing line”\textsuperscript{96}. The chimneys from the furnaces below penetrate through to the garden above. Stairs from the roof garden allow the connection between the two spaces.

\textsuperscript{95} Ibid., 233
\textsuperscript{96} Meijenfeldt, \textit{Below Ground Level : Creating New Spaces for Contemporary Architecture}, 99
As my design process progressed throughout the year, it became apparent that while responsive architecture had the ability to positively affect the internal environment of the chapel space, it didn’t necessarily have the same potency in the crematorium spaces. A chapel service requires visitors and family to remain seated in an orderly fashion while formalities are carried out, and in turn, a responsive skin provides relief for the architecture by affecting the space without requiring the occupants to physically change their disposition. A system which automates the amount of light which enters the chapel space so that it is in sync with the physical expression of opening ourselves up during a service, doesn’t assume the way in which we should act at this time. It rather enhances the act of something that we have already given consent to doing.

However, as we move into the spaces of a crematorium, the need of the mourner changes in a way which becomes specific to each individual. In times of grief, where overwhelming emotions have the potential to physically make someone unable to stand on their own two feet, they are more likely to “identify with settings they have casually appropriated…and not, by contrast, with settings that monitor, control, and foist a guaranteed
experience on them.” We all react to death in a different way, making this a time where social choices are the most comforting of all. The tactility of materials comes to the forefront, and responsive architectures lose ground in this realm as they begin to lose the corporeal sensation and connection between bodies and building. Building components don’t physically need to move for a work of architecture to speak about motion. Although responsive architecture is not utilised, the antagonistic agenda of both the static and the dynamic are still very much present in the crematorium spaces, through the use of nature, light, and shadow – the actual movements of elements is merely an extension of the original idea. In our age of technological saturation, “response to place becomes the most practical adaptation strategy of all.”

Early in the design process, an open casket room was designated as part of the funerary process. However, in an attempt to dissipate the “strengthening of boundaries between living and dying bodies,” the lack of providing this space attempts to expel society’s reluctance to be in contact with the dead, promoting a reconnection with the deceased at home. This not only eliminates choice, but it imposes values on the bereaved, stating that it is part of the process. The organisation of current funerary proceedings, serve to keep the recently bereaved away from any immediately visible signs of dead bodies. Typically, the committal takes place in the coffins existing

97 McCullough, Digital Ground : Architecture, Pervasive Computing, and Environmental Knowing, 118
98 Ibid., 213
99 Mellor and Shilling, “Modernity, self-identity and the Sequestration of Death”, 424
resting place in the chapel, where it then descends to the crematorium, and the bereaved are ushered away. Some have the opportunity to view the caskets entry into the furnace from behind a glass window, but this is where the process ends. The reality is that the cremation process generally takes 2 hours, and this disconnection from mourners and the deceased is an important issue. Modernity has fuelled this impression, and deprived people of a language for dealing with this reality. The implications of living in a time where death has become a modern taboo, is that “the supression of death has fuelled an appetite for violent and perverse portrayals of death”\textsuperscript{100} – an effect which could be pronounced as being an ethos of the ‘pornographic’. As sex becomes pornographic when divorced from its natural human emotion of affection, “death becomes pornographic when it is severed from its natural human emotion, which is grief”\textsuperscript{101}.

So it became apparent, that the while the crematorium roof garden remained about providing a space that offered comfort to the bereaved, it was equally as much about creating a space which maintained an awareness of one’s own mortality – that looked grief in the eyes, and absorbed the reality of the process.

\textsuperscript{100} McIntosh, “Death, Every Day”, 243
\textsuperscript{101} Ibid., 243
“Since there has been life on earth, it is our feet which reminds us we are alive. We know we exist when we feel it in the soles of our feet...no matter how computerised the world may become, we will probably keep on walking and that will probably be the last thing we feel”102.

102 Frampton, “Corporeal Experience in the Architecture of Tadao Ando”, 318


"Distinguishing Concepts: Lexicons of Interactive Art and Architecture."


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