University of Huddersfield Repository

Pacey, Fiona Margaret

A need for silence

Original Citation


This version is available at http://eprints.hud.ac.uk/23694/

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: E.mailbox@hud.ac.uk.

http://eprints.hud.ac.uk/
Contents

Silence in society (1151 words)
Silence in music (3371 words)
Agnes Martin (156 words)
En route (990 words)
ein ton. eher kurz. sehr leise (Beuger, 1998) (210 words)
The space in between (100 words)
Aram Saroyan (5 words)
RS Thomas (346 words)
Not filling the frame (106 words)
Notes on scores (2255 words)
Scores

For string quartet (c.21 minutes)
The world a space to move into for tam tam (8-10 minutes)
Into thin air for piano (18 minutes)
For eight or more (30 minutes minimum)
Threshold of consciousness for cello (23-27 minutes)
What counsel has the hooded moon? for four voices (27-30 minutes)

Bibliography
“When we go into a forest we do not see the fallen rotting trees. We are inspired by a multitude of uprising trees. We even hear a silence when it is not really silent.”

Agnes Martin (in Schwartz (Ed.), 1992, p153)


Walking with a friend, on a beautiful spring day with a fresh breeze, we found a quiet spot for lunch on this Bronze Age hill fort, out of the wind.

In the “silence” within the space of a minute we heard:

- sheep
- a distant hum that turned out to be a tractor
- a crow
- a skylark
- wind in a small group of conifers
- a plane high up in the sky
- an insect buzzing as it flew past
- a lorry on a distant road
- the crackling of dead bracken
- my friend heard the ringing of tinnitus in her ear. I tuned mine out.
For years I followed the mantra of "filling the frame" in my photography, in the same way that I would expect to fill a piece of music with sound, punctuated by a few rests. But space in a photograph helps to focus on the subject and silent space in music draws attention to the smallest possible events, subtleties and nuances that would otherwise be missed.

"I [ ] find that leaving space in an image encourages the viewer to spend longer looking, almost as if the emptiness has opened their mind that allows their imagination to run free." (Frost, 2013, p54.)
But the silence in the mind is when we live best, within listening distance of the silence we call God. This is the deep calling to deep of the psalm-writer, the bottomless ocean we launch an armada of our thoughts on, never arriving. It is a presence, then, whose margins are our margins; that calls us out over our own fathoms. What to do but draw a little nearer to such ubiquity by remaining still?

RS Thomas, 1990, p50

At a major exhibition of Rothko's paintings, (Tate Modern: Exhibition 26 September 2008 – 1 February, 2009) looking at Black on Black, I marvel at the profundity of the deep black, differentiated from the less deep black round the edges, only less deep because there are fewer layers of paint. I have lost patience with the flowery language of the booklet that goes with the exhibition, and I have been just looking, experiencing. Black on Black draws me into my own depths, into my own reflections and to my innermost being. It is an experience as profound as the black itself. On looking at the booklet, I find that this is the experience of many people who look at the painting. RS Thomas, in his powerful poetic use of English, describes my experience much more eloquently than I can. The "silence" of the black draws me into my “own fathoms” of silence (op. cit.).

In silence, I am. In silence there is no need to think about my surroundings, respond to others, or even be aware of others. Nothing is there to distract me from my innermost thoughts. The margins of the silence are the same as my own margins; it surrounds me and the only boundaries are of my own creation, or the limits of my own mind. In silence I can listen for shadows of elusive truth, for presence of illumination or insight, for unconscious thoughts to rise into consciousness. In silence I can enter an "other" world where utterance is both inadequate and superfluous, where I am and nothing more needs to be said.
The space in between

On the one hand there is the tangible, that which is, which can be interpreted and labelled objectively, without too much personal investment. It can be measured, weighed, analysed. In the tangible, I know.

On the other hand there is the intangible, the reflection, which is on the surface and two-dimensional, but which nevertheless appears to have unfathomable depth and which invites deeper personal investment and inward reflection to mirror the surface reflection. In reflection, I am.

In between is the empty space, the "silence" that bridges the above-surface world with the below-surface world.
A need for silence

Aram Saroyan (1968)

Fiona Pacey MAR July 2014
In the seminar in Cerenem on 12\textsuperscript{th} March 2013, Seth Woods (cello) and Alba Bru (flute) played for us Beuger’s \textit{ein ton. eher kurz. sehr leise} (1998), a text score in which each player is asked to play a tone, short and quiet, within a half minute silence. The noise outside the room was considerable and afterwards visiting Prof Peter Ablinger commented that the only silent part was when tones were being played. There was for me considerable tension in waiting for the tones, wondering whether they would be sooner or later within their half minute and afterwards the players said that it was quite nerve-racking for them, too. I was impressed by the concentration with which students were listening, and it reminded me of the Quaker meetings that I attend, with words coming out of silence and being left to hang in silence, as it were. In the seminar the quality of listening both for players and listeners was palpable, an active participation:

“A reaching out, or a searching, [w]hen the actual process of gaining information by perception shifts responsibility to the receiver, rather than external sources providing sensory information to the individual, who then receives.” (Glover, 2013, p9-10.)
My kind of silence.

a space of in-between worlds,
a world that is, a world that might be,
a concrete world, an imaginary world,
an outer world, an inner world,
an in-your-face world, an in-your-mind world,
a world of finite possibilities, a world of infinite possibilities.

I have always needed my own space and solitude in which to think. At work I sat through many meetings and in church many services in which I thought “if only they would stop talking, I could think.” Other colleagues at work thought aloud in speech whilst I, always introspective, preferred to think first and then speak. Walking was my favoured form of solitude, in which the rhythm of my feet helped my thoughts to rise from some unfathomable deep space within. It was a time for my instincts to come to the fore, which were usually more useful in my case than mindful logic.

Four years ago a casual comment from a work colleague gave me the final nudge to attend a Quaker meeting. I found a great relief in meetings where nobody spoke unless they had something to say and also a sense of the power of people sitting together in silence for an hour. I have been attending most Sunday mornings since that first visit.

15 years ago I wrote a piece of music for string quartet that included a lot of silences, the first one at the very beginning of the piece. It seemed to me that the silences gave time for reflection and contemplation. The piece was for a friend who had had a catastrophic accident that left him in a wheelchair for the rest of his life. Somehow the silences seemed appropriate for such a life changing experience, which had to be processed and assimilated alone, because no one else can truly enter into it, however, empathetic, they may be. At the time I was unaware of the Wandelweiser group and other composers who included silence in their music. I was, of course, aware of Cage’s 4’ 33” (and indeed, performed a short version of it with a violin group that I was teaching in a school concert.) My quartet piece felt very daring, although the silences were relatively short!
As I began the MA by research course at Huddersfield, I was not very sure what kind of music I wanted to compose. I found some of the more surface-complex pieces very difficult to listen to in what seemed to me an overload of information. I wanted to write from the heart, not from the mind.

I am not normally given to epiphanies, but I had one, at a concert of the music of Eliane Radigue in St Thomas’s Church, which was part of the 2012 Huddersfield Contemporary Music Festival. Two pieces were played; Occam River I (2011) for viola and clarinet and Occam Delta II (2012) for viola, bass clarinet and harp. I usually find it difficult to concentrate wholly on the music for long, but I was completely engaged by the long and sustained but never staying the same sounds. The viola player’s bow moved so slowly that the sound was unstable (even more so on detuned strings) and there was a constant change in a rich and deeply complex timbre that I found compelling. It was for me “immersive listening” (Glover and Harrison, 2013).

“The freedom to be immersed in the ambivalence of continuous modulation with the uncertainty of being and / or not being in this or that mode or tonality. The freedom to let yourself be overwhelmed, submerged in a continuous sound flow where perceptual acuity is heightened through the discovery of a certain slight beating, there in the background, pulsations, breath.”

(Eliane Radigue, in the programme notes for the concert given on Monday, 19th November, in St Thomas’s Church, as part of the 2012 Huddersfield Contemporary Music Festival)

I knew then that I wanted to compose music that would be like it in its introspection, use of sustained sounds and avoidance of surface-complexity.

Following that concert I learnt more about the Wandelweiser group and their use of silence and/or sustained sound. Another significant moment was on March 12, 2012, in Bryn Harrison’s seminar, when two students played Beuger’s ein ton. eher kurz. sehr leise. We heard one short tone played quietly in each half minute, alternating between the two performers. Clearly in this piece there was far more silence than sound, although there was a lot of extraneous sound, to the extent that Prof Peter Ablinger commented that the only
real silence was when the tones were being played. Nevertheless, I was listening intently for the next sound, wondering where it would be placed within the half minute and, later in the piece when one of the players dropped out, within the minute. Afterwards the players themselves said it was quite an unnerving piece to play, concentrating on where to place the tone and each time having to produce it out of the silence. I enjoyed the sensation of sound coming out of silence, of the anticipation of the moment when it happened, of the profound simplicity of those moments and of the experience of music pared to the bone, with nothing superfluous.

This experience reminded me in a way of a Quaker meeting and it prompted me to write a text score *For eight or more*, which was tried out by both a group of Quakers and the Huddersfield University Edges group. This turned out to be a very different experience for each group, which is described elsewhere in this dissertation. Following that a piece for string quartet explored sustained sounds and slow changes, but with few silences. Subsequent pieces began to explore the use of silence and I tried to recreate for listeners something that would be “immersive” for them as it was for me.
Silence in music

Bring us, O Lord God, at our last awakening, into the house and gate of heaven, to enter into that gate and dwell in that house, where there shall be no darkness nor dazzling, but one equal light; no noise, nor silence, but one equal music; no fears nor hopes, but one equal possession; no ends nor beginnings, but one equal eternity in the habitation of thy glory and Dominion, world without end, Amen. (My italics)

John Donne, Dean of St Pauls (1571?-1631) (SPCK Classic Prayers)

John Donne was the Dean of St Paul’s and a metaphysical poet. His words, spoken at the end of a sermon delivered in 1627, have been set to music by William Harris (1883-1973) and James MacMillan (b. 1959). Donne’s words suggest a parity of sound and silence in music, more than 300 years before Cage’s widely known 4’ 33”.

There cannot be music without silence. Music is always framed within silence, it comes out of silence and sinks back into it at its end. In a sense the compositional process of selecting pitches, rhythms and durations from an infinite number of possibilities, implies that all those elements left out that might have been included are silenced, in order to avoid complete
There are intrinsic silences within music. In early Western chant, Psalms included rests for the monks to breathe in and out of the holy spirit (Hornby in Losseff and Doctor, 2007), a practice that continues to this day (though perhaps without much awareness of the holy spirit!). An example of a different kind of silence, a very dramatic one, is heard in Benjamin Britten's opera, Peter Grimes (1945). This is how I wrote of my experience of it:

At a performance of Peter Grimes given by Opera North in Leeds Grand Theatre in November, 2013, the audience is waiting in anticipation for the grim but powerful hours ahead. There is never a chance of a better ending than in previous performances, though I always hope. Britten is a wonderful conveyer of ambiguity, and Grimes’ guilt is not clear-cut in the opera as it is in the poem.

The opera uses quite a large orchestra, and there is little let up in the stream of sound, with the exception of short rests in recitatives. Indeed, the stream of sound is as relentless as the townfolk’s suspicion and bad feeling towards Grimes.

During the first two acts there are two G.P.s, which barely register in my mind as I am watching the action on stage. In Act I, it’s a case of nonaction; the G.P. is a very telling one, as Grimes asks for help with his boat, and the crowd turns its collective back on him. The silence speaks loudly of Grimes’ isolation. The second G.P., much later in the opera, comes almost at the end of Grimes’ soliloquy lamenting his allotted path in life, again giving a sense of his isolation and his longing to be in any position but the one in which he finds himself. I can but empathise with him.

At the beginning of Act III, in Interlude V, I hear the loudest silences of all. My attention is fully engaged. A chord is followed by a G.P., then three more bars of chords, 4 beats’ rest, more chords for four bars and another 4 beats’ rest. The rests are all the louder for the homophonic pp chords that surround them. I know that the opera is now past the point of no return for Grimes, he is condemned and his end is inevitable. Ambiguity is over. Silence speaks to devastating effect.

It was John Cage who turned silence in music from a means to an end into a sonic resource in his piece 4’ 33” of 1952. Cage was interested in Zen Buddhism and its emphasis on silence, contemplation and meditation, as well as in Rauschenberg’s white paintings of 1951 (Gann, 2010), which he interpreted as “an emptiness in which the shadow of the viewer, or other another viewer, could become part and parcel of the painting, just as unintended sounds would become part of 4’ 33”. Before such emptiness, you just wait to see what you will see” (Gann, 2010, p158). Cage was naturally anti-authoritarian and found that electronics gave him a freedom in his early music that structures dictated by harmony did not, so that his pieces became duration- rather than pitch-centred. He also aimed to keep
himself out of his music through chance methods of composition, in which silence became an equal resource with pitch and sound. “Inherent silence is equivalent to denial of the will” (Cage 1968, p53).

Gann quotes an interview with Alan Gillmor and Roger Shattuck in Kostelanetz in Conversing with Cage (1988, p68), in which Cage said that it had taken him four years to write 4’ 33”. In a cultural setting where audiences expected to hear sounds in music, it was a risky thing to do and, indeed, it lost Cage some of the audience at its first performance. (In 2014 it is still not an easy option in composition, as one of my fellow students said, “It takes balls to write silence”, Phil Maguire in conversation, 4/01/2014.) Nevertheless, it was a logical move for Cage and perhaps inevitable within the cultural direction of the times. In Zen Buddhism, playing a note is the same as not playing a note (Gann, 2010) and so silence is the same as sound.

Cage had originally planned to write a piece called Silent Prayer for muzak, which would have been a typical Cage protest against forced listening to music (Gann, 2010). Instead, 4’ 33” came into being. One of the results was to create a framework for the audience to hear ambient sounds, the sort of sounds that are buried by muzak. Cage said that music should be part of the environment and its noises (Cage 1968) and that silence in music was “bringing one’s intended actions into relation with the ambient unintended ones.” (Cage, 1968, p80).

Silence is quantifiably measurable only by its duration (although it can have different qualities such as “heavy”, “peaceful”, “pregnant”, or it can be expedient, as in “the elephant in the room”.) For Cage, duration, very specific for each of the three movements of 4’ 33”, came to be an important dimension in his music, particularly in the later Time Bracket and Number Pieces, which were essentially time- rather than pitch-centric (Weisser, 2003). As sound events became more and more spare in the later pieces the importance of the time structure was underlined.

A lifelong friend of Cage, Feldman too was wanting to move away from European avant-garde and serial methods of composition. He followed his instincts rather than any rules and
much of his later music was slow, very quiet, repetitive and sparsely scored. He was also a friend of the painter Rothko, whose vast, often monochrome, canvases were, perhaps, the painterly equivalent of Feldman’s music. Both Feldman and Rothko needed the audience to give time to the experience and to see or hear the artwork as it is. (Griffiths, 2010.) At the Rothko exhibition in Tate Modern: 26 September 2008 – 1 February 2009, I spent a long time looking at *Black on Black.*) Feldman saw his longer pieces in terms of scale rather than form. His slow, quiet and repetitive music can be heard as from places of spiritual otherness and transcendence (Ross, 2007), in the same way as Messiaen’s music (Hill and Christiaens in Losseff and Doctor, 2007).

“In Zen they say: If something is boring after two minutes, try it for four. If still boring, try it for eight, sixteen, thirty-two, and so on. Eventually, one discovers that it’s not boring at all, but very interesting.” (Cage, 1968, p93)

After Cage silence became, as he intended, a compositional resource as much as sound, in “one equal music” (Donne, 1627). Composers found freedom from producing torrents of notes, not only in silences, but also in (for some) sustained sounds and repetition, for example, Feldman, and the Wandelweiser group. Silence and sparse, sustained sound can be “very interesting” (Cage, 1968, p93).

Before going on to Cage’s musical legacy, a brief survey of academic responses to silence reveals an attempt by Link (1995) to answer the question of the meaning of silence. He begins by naming silence as a “signifier” that has no meaning in itself, other than the meaning experienced by the listener which will be drawn from the musical context within which it is heard. Frey called this the “colouring” of silence (1998, from the Wandelweiser website). Silence is immediate, because it is “where we are, not where it is.” (in Link, 1995, p219). It is highly individual and involves the listener in an active way. Although silence can be measured by duration, the paradox is that time is measured by events and silence has no events, so it has in a sense the quality of timelessness. Perhaps it is the sense of timelessness that leads writers to talk about eternity (for example, Doctor, 2007, Hill and Christiaens in the same volume). My view is that silence may not be timeless or eternal, but it is certainly full of infinite possibilities; like a river, it is not possible to experience the same silence twice, because of its contextuality and because of the unique ambience within which
each silence takes place. For Link “silence doesn’t relate as directly to what we think of a piece of music as much as it changes how we think.” (1995, p26)

Voegelin (2010) reflects philosophically on the experience of silence. For her Cage’s silence is related to Conceptual Art and cites as an example Mel Bochner’s 8” Measurement (1969):

Voegelin’s writing is both eloquent and elegant, so I will quote:

“When there is nothing to hear, so much starts to sound. Silence is not the absence of sound, but the beginning of listening.” (p83)

“The composer of silence composes not only auditory materiality, but also stages listening as the invention of sound. In this sense silence places the composer and the listener in corresponding locations: he is the composer as producer and I am the composer as listener.” (p90)

“Silence is the place of the ‘I’ in the listened-to world. However, this is not a confident, theoretical ‘I’ but an ‘I’ in doubt about his position, for ever awkward about being in the middle of the ‘picture’.” (p93)

The first quotation might well have been true for some of the audience at the first performance of 4’ 33” and the second echoes Link’s observation that silence necessarily involves the listener more actively than does sound. The third reflects the difficulties some feel in the face of silence, when they are just left with themselves, without distraction and without any hiding place. In Beuger’s words, “people find it difficult within themselves” (in interview with Sarah Mohr-Pietsch HCMF 19/11/13).

The Wandelweiser group began in the early 1990s (Pisaro,
erstwords.blogspot.com/2009/09/wandelweiser) as a loosely connected group of German-based composers. They shared an interest in silence, duration and in radically extending Cage’s ideas. Like Cage they wanted to move away from contemporary Germanic organisations and to explore “the relationship between silence and noise and the function of tone within that continuum” (op. cit.). Their music does not have an identifiable style or genre, but often scores are sparse, with sustained sounds revealing richness and complexity. “A single note, chord held on for a long time, played by a human, develops, its own complexity,” James Clarke, (verbal communication, Research Forum, Cerenem, 2014). Such music requires “immersive listening” (Glover and Harrison, 2013).

The Wandelweiser group are composers interested in developing quiet, often silent and sometimes long works with few events in them (Pisaro, 2009). Antoine Beuger and Jürg Frey were two of the earlier associates of the group. There was never a manifesto or a statement of objectives, but members shared an interest in moving away from German and European avant-garde music. A starting point was the 1991 Internationale Kompositionsseminar at the Künstlerhaus Boswil, attended by both Beuger and Frey (Melia, 2011), entitled “Stille Musik”. Melia identified a spiritual aspect in such music, but found it more indicative of current philosophical thought about silence (Heidegger, Derrida and Badiou), and the political and aesthetic upheavals of the 1980s than of the more traditional God. A more down-to-earth reason for silence and quiet in music that appeals to me was voiced by Malfatti (in Barrett, 2012);

“Almost all the music which mercilessly surrounds us today is the same underlying structure: never-ending gabbiness. What’s the difference between MTV music and most of the classical avant-garde? They use different material, but they’re both intensely talkative.”

As an introvert in a world dominated by extroverts, needing silence and solitude to enable me to think, this is clearly an attractive, if provocative, statement. I cannot remember how many times I have thought, “If only they would all be quiet, I could think”. For me, silent or near silent music gives space in which to listen and “be”. Silence has within it infinite space and sustained tones, each a statement in themselves, are full of infinite possibilities and complexities. For Beuger, silence is
“a direct - not symbolic or imaginative - encounter with reality, which means with contingency, singularity, emptiness. Silence in my music always is [an] encounter with reality.” (in Barrett, 2012, p460).

As a number of people have found, in silence there is no hiding place and one is confronted with oneself. (Perhaps this reality is the God sought by many through the centuries in silence - eternal truth, which “never arrives” (RS Thomas, 1990, p50).

My thoughts on listening to Wolff’s Stones (1969): the piece lasts about an hour in this performance, I hear vast spaces of silence, within which the performers drop stones onto the floor occasionally. The silence somehow seem very deep and it is enhanced rather than interrupted by the sound of the stones. After each event, which is both beautiful and welcome, the sound lingers in my memory for a while, fading as time passes. Each time the ensuing silence is subtly different, not quite the same as the one before. I am sorry when the piece comes to an end. In this piece the silences, perhaps because of their length, do not leave me wondering when the next sound event will be.

In contrast, listening to Beuger’s ein ton. eher kurz. sehr leise (1998), played to us by two students in a seminar, was full of tension, both for the audience and for the players, waiting for the next event to happen, perhaps because each event was within only half a minute of the next. For the players there was an extra tension in having to break the silence.

Within the Wandelweiser group there are different understandings of silence. For Beuger it “cuts” into timeless sound/noise (in interview with Saunders, 2009, p231). A musical event has in itself infinite possibilities and, like silences, no two sounds are alike. The appearance/disappearance of sounds are indistinguishable since that which starts must also finish, like Donne’s “no ends, nor beginnings” (Donne, 1627). Silence can be uncomfortable because “people find it difficult within themselves” (in interview with Sarah Mohr-Pietsch HCMF 19/11/13). As silence is a time when nothing happens, for Beuger so is a repetition of sound, which also is stillness.

Experiences of Beuger’s en una noche oscura, HCMF, 19.11.13

Beuger’s piece is a setting of words of St John of the Cross. The instrumentalists are each given a line of five or eight pitches to play within the first half of each half-hour. During the second 15 minutes the singer places spaced out syllables in the empty space of silence. The performance lasts for four hours in total. On this occasion the instruments were guitar played with an ebow, melodica, flute, clarinet, cello,
accordion and organ. Beuger himself was present.

My thoughts:
There are no markers such as cadences and patterns or melodic/pitch clusters. Sounds emerge from nothing and disappear into nothing. There are times of silence. Then 2-3 play at once, just discrete pitches heard in isolation, so that there is a sense of stasis throughout. Do sounds interrupt silence? No, for me there is equilibrium, “one equal music” (Donne, 1627). Loudness would be a violation in this piece. Is sound from the deep or from high? Both, it’s all enveloping. I’m in the performance and it needs me. I wish there were no ambient sounds, it's not very quiet at all. The first hour goes slowly but then I become much more receptive and time passes more quickly. The open C string on the cello sounds so deep. Irene’s voice is so seductive.

The complete silence in the first 15 minutes of the last half-hour is so startling it wakes me up.

Afterwards:
One performer said by the third hour when she found herself with 5-8 notes to play she thought "this is going to be quite busy." Another performer didn't know how to deal with the silence, there was nothing but himself in it.

For Werder (in interview with Saunders, 2009, p354) silence brings “being” and it is an interaction as it is for Voegelin (2010):

“A performance proposes and creates a specific intersection of articulation, context and the listeners experience and perception in a heterogeneous mutuality. The more balanced the meeting of all parts, the more challenging an event may emerge.” (In Saunders, p354)

For Günter (in interview with Saunders, 2009) hearing is a thing in itself and silence or near silent music can be heard with no expectations or cultural conditioning. His pieces are quiet and non-aggressive, with tiny details, so that the listener can lean into it and become part of the performance.

Frey explores silence as a space, which is coloured by the immediately preceding sounds (cf Link, 1995), and in which the memory of those sounds fades. Silence is permeable (1998, transl. Pisaro, from the Wandelweiser website). He also recognises the part of the audience: “in this silent dialogue with itself, the music and the audience are connected.” (1996, transl.)
Pisaro, from the Wandelweiser website). “[S]pace, sound and listener create a field of tension informed by the various balanced presences, a field that can become an existential experience of physical and mental existence for the listener.” (2004, transl. Pisaro, from the Wandelweiser website).

Houben perceives music on the borderline of audibility and silence as appearance and disappearance, and the space in between. “Fading sound is the link between life and art; between perception and daily life and perception while performing, while composing…. And the awareness of fading sound may become the awareness of presence.” (2007, from the Wandelweiser website.)

In all that has been said and written about silence in music, summarised in these pages, there is general agreement; that silence involves the listener in a way that sound does not; that it is coloured by sound; that it has a timeless or eternal quality, even though it is only measurable in time. All of these ring true for me, as does the spiritual/truth/God element, that silence or near silence is the porous membrane between two realities identified by Houben as life and art, or between Gumbrecht’s “presence” and the world that most of us live in for most of the time, that is both articulated and limited by language. I would like to occupy what I call “the space in between”, or create space for the listener to use her own imagination, as I have tried to do in my recent photography for the viewer by “not filling the frame.” Perhaps poetry is the nearest other artform to such music, in so far as it uses no superfluous words and often expresses through words a significance beyond their literal meaning. I would like to think that my music contains no superfluous sound events and that listeners can “lean into” a performance of it and experience their own “presence” and that as each sound event just “is”, so they just “are”. Or, as Winterson put it, “Look into a Hepworth hole and you are looking at what matter normally conceals – everything that matter cannot express.” (www.tate.org.uk/magazine/issue5/hepworth.htm 2003)
Silence in Society

"I have often regretted my speech, never my silence." Xenocrates (396-314 BCE) (Classic Quotes)

Silence in society may be an oxymoron. Where there are people, there is very little silence. Indeed, where there is nature, there is also very little silence. But society is the focus here and this will be a brief consideration of the place of silence in people's lives throughout history, from religious or spiritual use of silence to a more secular focus, in which John Cage's 4’ 33″ will be seen as a significant step in 20th century cultural experience.

Interest in silence is not a contemporary phenomenon, as is shown by the words of Xenocrates. It was sufficiently important in early civilisations for them to have gods of silence (McCulloch, 2013). People, it seems, have always felt the need for silence, perhaps for personal space.

The meaning of silence is, like most words, partly embedded in its antonym; the absence of noise or sound. There is no understanding of the word silence if there is not also an understanding of the meaning of noise/sound. Both are intrinsic to humanity and, as opposites, too much of one leads to the seeking out of more of the other. One individual's tolerance is markedly different from another’s and there are extremes at either end of the continuum, as well as all points between.

There are different sorts of silences; the legal right to silence; peaceful silence; ominous silence; empathetic silence (in the Old Testament book of Job, his friends sat with him in silence for one whole week, knowing his parlous state); sullen silence; silence that allows space for thought; “not speaking to enemies” silence; silence that is held instead of speaking out against injustice (the Holocaust, for example); the “elephant in the room” kind of silence (in societies where freedom of speech is not a given, for example); purposeful silence (silent religious groups, for example, who use silence as a means of getting close to God); enforced silence and voluntary silence; silence as a powerful weapon (such as the Quakers in the 17th century, who maintained a silence against which drums that were beaten to stop other
dissenting meetings, were powerless (McCulloch, 2013)). Some silences are positive, some have negative connotations and others result from necessity or expediency.

Silence, then, has been a necessary and integral part of life, ever since life began.

In the early church, and also in eastern religious life, silence gradually came to be seen as a means of getting to know God, the transcendent “unknowable” (McCulloch, 2013). (Ironically, this was in the context of a long history, as exemplified in the Psalms, for example, of complaints that God himself had remained silent in both personal and national lives.) Silent monastic orders were established that practised silence in meditation and contemplation in pursuit of holiness and closeness to God. Later, in mediaeval times, there were mystics who used meditation and contemplation as a means to a visionary access to God. By this time the church was dominated by men, and it is notable that many of the mystics were women (Julian of Norwich, for example). Mysticism was a means towards spirituality “independent of formal intellectual training, that enables both mind and imagination to seek out the hiddenness of God beyond doctrinal propositions or the argumentative clashes of scholasticism.” (McCulloch, 2013, p120).

The Protestant Reformation of the 16th and 17th centuries brought about a diminishing of the monasteries and silence became less of a formal, institutionalised activity and more emphasis was given to “inner” silence (McCulloch, 2013), for example amongst the Quakers who came to be during the 17th century. Their silence was much more egalitarian and open to all, men and women alike.

Societal silence seems to have been submerged following the Age of Enlightenment, during which rational thought took the place, to a certain extent, of old beliefs that were unquestioning about God and man’s place in the world. Truth could be reached rationally and the meaning of everything could be verbalised, it was thought (Gumbrecht, 2004.) In the West the 19th century brought the Industrial Revolution to its fulfilment and it must have been a century of noisy machinery and clatter wherever there were factories and their supporting industries. Maybe the noise was tolerated because it represented “progress” and the creation of wealth. Life away from the industrial hubs was quieter and there were oases
in hallowed places such as churches, concert halls and libraries, where listening and study were afforded a silent privilege.

It was in the 20th century that there was a renewed interest in silence. Wittgenstein was influential as a philosopher in the first part of the century. He spoke of the limitations of language; “Whereof one cannot speak, thereof one must be silent.” (1921). Heidegger developed the idea of “being” and “time” (Gumbrecht, 2004), both of which are integral to the experience of silence. Melia (2011) attributes later 20th century interest in silence, not only to Heidegger’s influence, but also to the political and aesthetic upheavals of the 1980s.

In arts other than music the equivalents of silence were being explored, for example, by Barbara Hepworth and Henry Moore in sculpture. Hepworth is well-known for her sculptures with holes in them; the first example was Pierced Form (1931). Visiting a retrospective exhibition of Hepworth’s work, Jeanette Winterson wrote some very perceptive comments (2003):

“Look into a Hepworth hole and you are looking at what matter normally conceals – everything that matter cannot express.”
“I sometimes feel that Hepworth’s sculptures are inversions – that the object, however beautiful, is a way of seeing what surrounds it.”
“….and she made space into its own form.”
"Hepworth made an astonishing discovery the day she pierced one of her sculptures. She allowed us to see nothing – a privilege previously enjoyed only by God."

Winterson expresses eloquently something similar to my own response on seeing Rothko’s Black on Black (1964). Ad Reinhardt’s black paintings are similarly of “nothing” - a very profound “nothing”. In theatre Samuel Beckett wrote Waiting for Godot (1956), which critic Vivian Mercier described as a play which

"has achieved a theoretical impossibility—a play in which nothing happens, that yet keeps audiences glued to their seats. What’s more, since the second act is a subtly different reprise of the first, he has written a play in which nothing happens, twice." (Irish Times, 18 February 1956, p6.)

Architects were using glass to create buildings that afforded open views to the outside world. Two such, who had considerable influence on John Cage were Moholy-Nagy and van der Rohe (Joseph, 1997).
In the middle part of the 20th century there was increased interest in Eastern religions, a number of which embrace meditation and contemplation as a way of life. Zen, in particular, had a major influence on John Cage in his thinking and methods of composition (Cage, 1968), and through Cage’s wide-ranging writings, lectures and music, many of those thoughts and methods became almost ubiquitous in experimental music.

A need for silence has always been there in society, not for everyone, but perhaps for a substantial minority, and art, as so often, has been the means of identifying the need and providing a solution.
Notes on Scores

The music that appeals to me is the abstract, and that which is reflective and causes the listener to be reflective. In a sense, almost all music is abstract, but traditionally there has been "form" in terms of tonalities, modulation, melody, counterpoint, rhythm and so on. Each of these become self-referential as the music unfolds. Much of the alternative "form" of the 20th century found in serial music became equally bound by methodology and systems.

Composers wanting to be free of rules and methodologies developed in all manner of different ways, chiefly influenced by John Cage, Feldman and others. Composers who explored the possibilities of sound in an abstract and reflective way are to be found in the Wandelweiser group, not exclusively, but it is an influential group, albeit a loose one without a mission statement or agreed agenda. These composers have developed a simpler and gentler expression of music than many of their contemporaries, exploring the possibilities of silence, of a minimal number of sound events which are in themselves very simple in execution, but which become very complex on hearing them.

Günter said "I need to give each sound the time to present itself, to have, so to speak, a right to its own lifespan, the time to arise, last, decay and finally disappear." (In interview with Saunders, 2009, p274.) Each sound exists for itself, with no outside referent. In Beuger's words "Each sound is an infinity in itself. No two sounds are ever alike. So only a few sounds are needed." (In interview with Saunders, 2009, p231.) Werder's instructions in later scores were invariably "To itself, clear and objective. Simple." (In interview with Saunders, 2009, p353.) In the same interview Werder identifies two parallel worlds, that of being, in the silence, and that of observing, when sounds are articulated. This is very much my experience at the performance of Beuger's en una nocha oscura (2004), amongst other pieces. I would hope listeners to my pieces would have the same kind of experience, particularly in into thin air for piano and Threshold of consciousness for cello. Houben (2010, retrieved from the Wandelweiser website) talks about sounds having a presence, appearing and disappearing, almost having "no ends nor beginnings, but one equal eternity" in the words of the metaphysical poet Donne (1627, SPCK Classic Prayers).
In this music time and space become almost interchangeable. For Frey time is experienced as an expanse without direction, within which sound events are like a path. This suggests to me the idea of a path in the landscape, its ends not in sight, but having a direction, so that walkers can be seen moving along it, their starting point and destination unknown. Günter describes time in art, not as an exercise ticking off seconds, but as living personal time and (in interview with Saunders, 2009), which is experienced, lived in. There is freedom from the clock. This was also my experience in the performance of *en una nocha oscura*, and of Beuger's *ein ton. eher kurz. sehr leise*. (1998) although both pieces require stopwatches for the performers. It was also true when I listened to Wolff's *Stones* (1969). My piece *A space the world to move in* for tam tam attempted to lead the listener into a perceived infinite expanse of space and time.

A third characteristic of Wandelweiser music is its organic nature. It grows from a single idea and its boundaries are those of the potential of that idea (Werder, in interview with Saunders, 2009) Günter said "composition [...] helps the material unfold its potential." (In interview with Saunders, 2009, p274). As an instinctive composer, the word "organic" is very apt for me. I begin with a cell-idea, and develop it until I feel that as much has been said as needs to be said. I have learned that music can "be" without a clear structure and that it can float into hearing, as it were, and float out again as if appearing from a sub-surface place and sinking back into that place.

The keywords for me are “in between”, “appearance and disappearance”, “barely audible”, “each sound existing for itself”, “space”, “infinite possibilities”, “simple”, “organic”, and my pieces represent my experimentation into this sound world.
Notes on scores
The music that appeals to me is the abstract, and that which is reflective and causes the listener to be reflective. In a sense, almost all music is abstract, but traditionally there has been "form" in terms of tonalities, modulation, melody, counterpoint, rhythm and so on. Each of these become self-referential as the music unfolds. Much of the alternative "form" of the 20th century found in serial music became equally bound by methodology and systems.

Composers wanting to be free of rules and methodologies developed in all manner of different ways, chiefly influenced by John Cage, Feldman and others. Composers who explored the possibilities of sound in an abstract and reflective way are to be found in the Wandelweiser group, not exclusively, but it is an influential group, albeit a loose one without a mission statement or agreed agenda. These composers have developed a simpler and gentler expression of music than many of their contemporaries, exploring the possibilities of silence, of a minimal number of sound events which are in themselves very simple in execution, but which become very complex on hearing them.

Günter said "I need to give each sound the time to present itself, to have, so to speak, a right to its own lifespan, the time to arise, last, decay and finally disappear." (In interview with Saunders, 2009, p274.) Each sound exists for itself, with no outside referent. In Beuger's words "Each sound is an infinity in itself. No two sounds are ever alike. So only a few sounds are needed." (In interview with Saunders, 2009, p231.) Werder's instructions in later scores were invariably "To itself, clear and objective. Simple." (In interview with Saunders, 2009, p353.) In the same interview Werder identifies two parallel worlds, that of being in the silence, and that of observing, when sounds are articulated. This is very much my experience at the performance of Beuger's en una noche oscura (2004), amongst other pieces. I would hope listeners to my pieces would have the same kind of experience, particularly in into thin air for piano and Threshold of consciousness for cello. Houben (2010, retrieved from the Wandelweiser website) talks about sounds having a presence, appearing and disappearing, almost having "no ends nor beginnings, but one equal eternity" in the words of the metaphysical poet Donne (1627, A Prayer. http://www.spck.org.uk/classic-prayers/john-donne).
In this music time and space become almost interchangeable. For Frey time is experienced as an expanse without direction, within which sound events are like a path. This suggests to me the idea of a path in the landscape, its ends not in sight, but having a direction, so that walkers can be seen moving along it, their starting point and destination unknown. Günter describes time in art, not as an exercise ticking off seconds, but as living personal time and (in interview with Saunders, 2009), which is experienced, lived in. There is freedom from the clock. This was also my experience in the performance of *en una nocha oscura*, and of Beuger's *ein ton. eher kurz. sehr leise*. (1998) although both pieces require stopwatches for the performers. It was also true when I listened to Wolff's *Stones* (1969). My piece *A space the world to move in* for tam tam attempted to lead the listener into a perceived infinite expanse of space and time.

A third characteristic of Wandelweiser music is its organic nature. It grows from a single idea and its boundaries are those of the potential of that idea (Werder, in interview with Saunders, 2009) Günter said "composition [...] helps the material unfold its potential." (In interview with Saunders, 2009, p274). As an instinctive composer, the word "organic" is very apt for me. I begin with a cell-idea, and develop it until I feel that as much has been said as needs to be said. I have learned that music can "be" without a clear structure and that it can float into hearing, as it were, and float out again as if appearing from a sub-surface place and sinking back into that place.

The keywords for me are “in between”, “appearance and disappearance”, “barely audible”, “each sound existing for itself”, “space”, “infinite possibilities”, “simple”, “organic”, and my pieces represent my experimentation into this sound world.
Into thin air for piano was conceived as a piece with a sustained tone with “interruptions” sparsely placed. Its first draft was as a text piece. My written out realisation of the text score was workshopped by visiting pianist Mark Knoop, and in the light of both his comments and my listening to the piece, I felt I had been too timid in the “interruptions” and revised the music to include a few more of them, more widely dispersed across the keyboard, and making more use of clusters of notes. After this the text score was insufficient for a realisation of the piece as I had conceived it.

The use of ebows to sustain the pedal notes worked well, apart from the rather abrupt ending each time the sustaining pedal was taken off. Originally the ebow sounded for 20 seconds, followed by 10 seconds’ rest. It is possible to avoid the abrupt ending by taking the ebow off the string physically, so I rewrote the piece with longer pedal notes, so that this would be manageable for the performer. This made it necessary to use only one octave F rather than my original two, because the pianist would only have one hand for the manoeuvre.
For string quartet was my first attempt at writing a piece with sustained tones and gradual changes, inspired by the music of Eliane Radigue, in particular OCCAM RIVER I for viola and clarinet (2011) and OCCAM DELTA II for viola, bass clarinet and harp (2012), both heard at Huddersfield Contemporary Music Festival, and naldjorlak for cello (2007). Radigue said in the programme notes for the concert:

“The freedom to be immersed in the ambivalence of continuous modulation with the uncertainty of being and / or not being in this or that mode or tonality. The freedom to let yourself be overwhelmed, submerged in a continuous sound flow where perceptual acuity is heightened through the discovery of a certain slight beating, there in the background, pulsations, breath.”

Fiona Pacey

In the concert I was totally immersed in the sound of the pieces, in the richness of the sonority and of the context in which small changes sounded much more dramatic than I could have ever thought possible.

Initially in the string quartet I tried to give pairs of instruments alternating harmonics and stopped notes, with the intention that the effect would be one of the audible sonic subtleties. In practice, the difference between timbres could be heard, but the two instruments changing over sounded clumsy and the movement of harmonic from one instrument to another not really effective. On returning to the score several months later, I changed the harmonics to stay with one instrument. Having become more minimalist (with a lowercase m) in the intervening months, I also removed some repetition and put in longer silences. Glissando pitch changes are divergences from G or D, or convergences back to the main pitches.
I devised *For eight or more* following the performance in a Cerenem seminar (described elsewhere) of *ein ton. eher kurz. sehr leise* (Beuger, 1998). *For eight or more* was given a run through by Edges one Friday morning in Cerenem and also by a group of Quakers one evening in March, 2014. I was interested to know how each group would respond (a summary is found below), which turned out to be contrary to my expectations. It was the musicians who found tension within it, and the Quakers who found insufficient tension. It was evident, from both comments and from body language, that for the Edges’ members, listening to silence was a similar experience to that of Quakers in a Meeting. The silence was to be broken only by a sound or a word that would “justify making it.” As such, it was quite a deal to do so and actions were taken very seriously and sensitively.

**Quaker responses to *For eight or more***.

Sounds were made on small percussion instruments to begin with, then they began to use voices. The first sound was quite loud and set the pattern for subsequent contributions.

- At first quite inhibiting, but became relaxing.
- A creative, never to be repeated act.
- Looking for a pattern created by the sounds.
- Quality of silence... Uneasy after harsh sounds, gentle after soft sounds.
- Silence less deep than in Quaker meeting.
- Silence rather superficial but still expectant.
- It's unusual for me to sit in silence that has no apparent purpose, i.e. usually I'm meditating or worshipping. This silence was a challenge - to overcome inhibition.
- My first sounds were artificially decided, because I knew I was supposed to do something; later, I relaxed more and responded to whim.
- Instruments seemed to break the silence in the discordant way; voices eased in and out of the silence without breaking it.
- Silence varies in different situations - I know what to expect in my own home.
- A contrast with Quaker meeting; here we are not surrendering self so I am inhibited. The silence was shallow and brittle ready to shatter at any moment.

**Edges' response to *For eight***.

- It was like a Quaker meeting.
- I was worried that there wouldn't be any resistance to work with, but there was plenty. It was quite a thing to play in the silence.
- I got very nervous, the only sound I made was my heart beating (student who stood up and played a silence on his clarinet).
- I was trying to find a sound that would justify making it.
- The students' sounds were very quiet and gave the impression that they were almost afraid to break the silence.
A space the world to move in was my third post-Radigue piece and I was beginning to explore silence. I envisaged the piece as a contour line of dynamic range:

The intention was that the *diminuendo* would lead the listener into the central silent “hole” out of which would emerge the *crescendo*, back into the “above ground” world. In this piece, the silence is something into which sound dissolves and out of which sound re-emerges. My idea for the structure was that the listener would be gently led into the silence, a space that would “require the participation of the receptive listener” (Harrison, 2013, p43).

The idea for the piece came from a percussion workshop held on 7th March, 2013 in St Paul’s Hall, Huddersfield, led by Julian Warburton. I wanted to write something that would incorporate the wonderful rich sonorities produced by a bass bow on the rim of a tam tam. I had also listened to Tenney’s *Never Having Written a Note for Percussion* (1991) performed on a tam tam, which showed me how wide a dynamic range the instrument has.
Threshold of Consciousness for cello explores the sonority of G and the strings of the instrument are tuned to maximise overtones and resonances. The de-tuned C string and the placing of the bow *sul ponticello* and *sul tasto*, together with the dynamic that is on the threshold of audibility, all result in a fragile and unstable music that requires close attention, with commitment and imagination from both the performer and the listener. *Glissandi* provide convergence and divergence from G and D and arrive at microtonal tunings that leave the sound hovering on their thresholds.

In this piece silence and near-silence are equal, neither one obliterating the other, each one very slightly to one side of audibility or inaudibility, even, perhaps, on the threshold or “margins” (RS Thomas, 1990 p50) between parallel worlds.
What counsel has the hooded moon? was the last piece written for the Master’s submission. I wanted to further develop the idea of silences between sonic events as I had done in Threshold of consciousness for cello. The cello piece centres on the note G and its sonorities. This time I wanted to challenge myself again to centring the piece on a single pitch, keeping the pitch band to within one whole tone throughout. The intention was that after several minutes on one pitch, a glissando of a quarter tone would sound like a major event. I used random numbers within a diminishing range for deciding the length of rests, and random numbers for each voice entry. I did not plan a structure for the piece, but a recognisable structure emerged when it became apparent that the first opportunity to use all four voices at once dictated by the random numbering came about three quarters of the way through, so that all preceding events are heard as a buildup to a climax.

My idea was also for the singers to be very aware of each other in terms of selecting an agreed pitch, of judging or indicating when a breath is about to peter out, and behaving generally very much like a string quartet would do instinctively, as it seems to me that singers get fewer opportunities to do so. They would thus have some ownership of the performance. This was also the reason for the instruction to perform in a manner that would communicate introspection.

I intended silences and sounds to be equal, as I did in the cello piece, but voices cannot produce such fragile sounds as the cello can and the effect is more of sounds interrupting the silence.
Notes for performers

Strings are tuned in perfect fifths (just tuning).
Violin G strings are both tuned down to D (octave below third string).
Viola and cello C strings are both tuned down to G (octave below third string).
The piece is non-vibrato throughout, unless otherwise indicated.
Harmonics are written at sounding pitch.

Fiona Pacey April 2013

\[ \frac{\text{flautando to b.29}}{\text{sul IV}} \]

\[ \frac{\text{flautando to b.29}}{\text{sul IV}} \]

\[ \frac{(\text{sul IV})}{\text{(sul IV)}} \]

\[ \frac{\text{flautando to b.29}}{\text{sul IV}} \]

\[ \frac{\text{sul IV}}{\text{(sul IV)}} \]

\[ \frac{\text{flautando to b.29}}{\text{sul IV}} \]

\[ \frac{\text{sul IV}}{\text{(sul IV)}} \]

\[ \frac{\text{flautando to b.29}}{\text{sul IV}} \]

\[ \frac{\text{sul IV}}{\text{(sul IV)}} \]

\[ \frac{\text{flautando to b.29}}{\text{sul IV}} \]

\[ \frac{\text{sul IV}}{\text{(sul IV)}} \]
Vln. I

Vln. II

Vla.

Vc.

\( \text{gliss.} +5c \) 
\( \text{gliss.} +4c \) 
\( \text{gliss.} \)

\( \text{sul III, norm,} \)

\( \text{gliss.} -14c \) 
\( \text{gliss.} -31c \)

\( \text{pp} \)

\( \text{sul III, norm,} \)

\( \text{pp} \)

\( \text{pp} \)
norm., flautando

norm., flautando

norm., flautando
Threshold of Consciousness

For Cello

Fiona Pacey

2014
Notes for performance.

*Scordatura*

Fifths are to be "just" fifths i.e. 2c greater than an equal tempered fifth.

All bowed notes are to be played as long as possible (45 seconds or more), with a very slow stroke, and, therefore, necessarily *pppp*.

All bow strokes should be *flautando* except where otherwise stated.

Instability in tone is welcomed!

To be played without vibrato throughout.

Harmonics are written at pitch.

Notes on de-tuned strings are written at pitch.

Each sound event is flanked by two rests. These should be of between 5 and 10 seconds duration i.e in combination, between 10 and 20 seconds.

Bar lines are there for the player to differentiate between one event and the next.
What counsel has the hooded moon?

For four voices
Notes for performance.

The four singers (any voices) agree on a pitch comfortable for all, which is represented by the continuous line throughout the piece, a dashed line for silence, and a solid line for sung tones.

Each tone lasts for a full breath.

Voices that start together should also finish together.

Tone lengths should be subdivided into three for changing vowel sounds and for second/subsequent entries.

Glissandi last for the whole breath as much as possible.

There should be as little vibrato as possible.

The piece is quiet and introspective. It should be sung at a comfortable, appropriate dynamic.

Vowel sounds

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Sound</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>ɑ</td>
<td>ah</td>
<td>as in father</td>
</tr>
<tr>
<td>ɛ</td>
<td>eh</td>
<td>as in many</td>
</tr>
<tr>
<td>ɪ</td>
<td>ih</td>
<td>as in hit</td>
</tr>
<tr>
<td>ɑe</td>
<td>ah</td>
<td>as in cat</td>
</tr>
<tr>
<td>u</td>
<td>oo</td>
<td>as in blue</td>
</tr>
<tr>
<td>ju</td>
<td>as in view</td>
<td></td>
</tr>
<tr>
<td>ɒ</td>
<td>short o</td>
<td>as in on,</td>
</tr>
<tr>
<td>ɔ</td>
<td>ow</td>
<td>as in awful</td>
</tr>
</tbody>
</table>
c. 30" - 50c $+\frac{100}{100}$

$V_1$ $V_3$ $V_4$

$\alpha$ $\varepsilon$ $\approx$

$-\frac{50}{100}$

$V_1$ $V_3$ $V_4$

$\approx$ $\alpha$

$-\frac{50}{100}$

$V_3$

$c. 10"$

$+\frac{50}{100}$

$V_3$

$c. 10"$ $V_3$

$c. 15"$

$\alpha$

$-\frac{50}{100}$

$V_2$

$c. 15"$

$\alpha$

$-\frac{50}{100}$

$V_2$

$c. 15"$ $V_4$

$c. 15"$ $V_4$

$\approx$

$-\frac{100}{100}$

$V_4$

$c. 10"$ $V_4$

$c. 40"$ $V_4$

$c. 15"$

$\approx$

$\approx$

$-\frac{100}{100}$

$ju$

$c. 10"$

$V_4$

$c. 40"$

$V_4$

$c. 15"$

$\approx$

$\approx$

$\approx$

$\approx$

$-\frac{100}{100}$

$ju$

$c. 10"$

$V_4$

$c. 40"$

$V_4$

$c. 15"$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$

$\approx$