# In Search of a Lost Language: Performing in Early-Recorded Style in Viola and String Quartet Repertoires

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## 2) Recorded Sound and Recording Technique

### 2.1) Introduction

This chapter makes the case for the use of lo-fi recording techniques in order to support the all-in approach to copying early recordings. I first explore the ideology underlying what I call the mainstream recording paradigm, which attempts to create the illusion of idealised, live performances. This runs counter to a lo-fi approach, whereby limited-frequency microphones focus on the mid-range of the sonic spectrum capturing moment-to-moment gestural information. I follow this with a discussion of how lo-fi recording affects performers, encouraging expressive gesture and de-emphasising neatness, tidiness and precision. I then examine lo-fi's technological specifications, focusing on the advantages derived from circumventing intermodulation distortion and achieving time domain blurring.

### 2.2) Mainstream Recording Paradigm

Many musicians and musician-researchers view the recording medium used to document their performances as 'transparent' or perhaps even 'objective.' In many musical research projects, the technological choices underpinning documentation do not even merit discussion. Similarly, a great number of performers often pay little attention to the role of technology when recording albums or concerts, leaving fundamental decisions about how they will sound on record to producers and engineers. This state of affairs has been thoroughly discussed by musicologist Amy Blier-Carruthers in *The Performer's Place in the Process and Product of Recording*.[103]

The goal of recorded music in the framework of today's MSPs is to create what culture and technology professor Jonathan Sterne calls "a realism that holds the place of reality without being it."[104] In other words, the recording medium itself is meant to become a transparent carrier of a virtual sonic reality. This view of recording has far-reaching consequences for the way recordings and performances influence one other. Because recordings represent a virtual reality, Nicholas Cook notes: "This helps to explain how recorded music can sound more like live performance than live performance

[103] Amy Blier-Carruthers, "The Performer's Place in the Process and Product of Recording," CMPCP Performance Studies Network International Conference, University of Cambridge, April 6, 2013, accessed July 4th, 2018, http://www.cmpcp.ac.uk/wp-content/uploads/2015/11/PSN2013_Blier-Carruthers.pdf.
[104] Mainstream performance practices as described in Chapter One. Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham: Duke University Press, 2003), 245.

does. It creates the sound image against which audiences measure live performance, driving the tendency…for concerts to increasingly resemble recordings."[105] This symbiotic relationship between performances and recordings is prevalent in WAM[106] culture, where the realism of recordings is the benchmark by which both musicians and audiences judge live performances that have been shaped by recordings, which in turn set the standard for future recordings. Marshall McLuhan's *Understanding Media: The Extensions of Man* illustrates the shortcomings inherent in viewing recordings as transparent placeholders of reality:

> In a culture like ours, long accustomed to splitting and dividing all things as a means of control, it is sometimes a bit of a shock to be reminded that, in operational and practical fact, the medium is the message. This is merely to say that the personal and social consequences of any medium-—that is, of any extension of ourselves—result from the new scale that is introduced into our affairs by each extension of ourselves, or by any new technology.[107]

Recorded sound can rightly be viewed as an extension of ourselves as performers—one that carries consequences in terms of how we create, listen to, and understand performance. If we view recorded music as an extension of ourselves, as McLuhan does, then the recording technologies and methods used are embedded in the content communicated by our recordings. In fact, the far-reaching personal and social consequences of recorded music have been central to the development of MSPs during the 20th century.[108] Acknowledging that the way we as musicians extend ourselves through recording has an impact on what we communicate *with* our recordings leads us to realise that the recording process itself is responsible for shaping what is communicated by the music recorded. The recording medium is thus tied to the communication of musical content and cannot be viewed as objective or transparent.

Both Robert Philip and Cook argue that recording technologies and processes are not transparent, and both authors have articulated the idea that the recording medium has had a profound and irreversible effect on musical culture and performance style. Cook argues that the mainstream view of the medium as a transparent conveyer of sound is central to WAM recording culture, where the success of a recording is contingent on the degree of transparency it achieves. Cook calls this attitude the 'Best Seat in the Hall' ideology and claims it has impeded the development of alternative,

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[105] Cook, *Beyond the Score,* 368.
[106] Western Art Music as discussed in Chapter One.
[107] Marshall McLuhan, *Understanding Media: The Extensions of Man* (New York: McGraw Hill, 1964), 7.
[108] See Philip, *Performing Music in the Age of Recording*, 25.

experimental recording practices.[109]

The view that the recording medium should be a transparent carrier of musical sounds is similar to MSP ideology (discussed at length in Chapter One), in which performers are required to reproduce musical works by attempting literal adherence to their notated scores and agreed-upon understandings of musical style. The result is that both performers and recordings become tools with which to convey the fixed, eternal 'intentions' of the composer. By pretending that the recording medium is transparent, we ignore both the sound and experience that modern 'Best Seat in the Hall' recordings are designed to create, much as we are unaware of how MSPs require performers to become transparent executors of musical scores. The desire for transparency, which is a central part of current mainstream recording practices, is expressed in award-winning sound engineer Morten Lindberg's view that:

> There is no method available today to reproduce the exact perception of attending a live performance. That leaves us with the art of illusion when it comes to recording music. As recording engineers and producers we need to do exactly the same as any good musician: interpret the music and the composer's intentions...Sometimes a lie can be more beautiful than the truth![110]

Lindberg's ultimate goal is thus to give us an illusion resembling a live performance, similar to what Sterne calls "realism that holds the place of reality."[111] In this way, if the recording medium is a discernible part of the end product, the illusion of reality will be destroyed. Although Lindberg recognises that recordings cannot reproduce the experience of hearing a live performance, he hints that they can improve upon this experience by way of the record producer's interpretation of the music. It is telling that, in this paradigm, representing the opaque intentions of the composer becomes the domain of the producer, who needs to make up for the fallibility of performers. In this way, the producer becomes responsible for creating an idealised realisation of the musical work-in-itself, the Platonic object, whereby his or her insight is required in order to lead ignorant performers towards the objective truth.[112] Lindberg further claims that new hi-fi surround-sound technology offers an unprecedented opportunity for creating an idealised performance on record, which can even exceed the experience of a live

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[109] Cook, *Beyond the Score,* 354*,* 376.
[110] Morton Lindberg, "2L - The Nordic Sound," 2009, accessed June 14, 2018, http://www.2l.no/pages/about.html.
[111] Sterne, *The Audible Past*, 245.
[112] The intentions of the composer and musical works as Platonic objects are discussed at length in Chapter One.

concert.[113] This represents the view of many record producers who strive to make the medium transparent, using their position in the control and editing rooms to improve upon what they see as the imperfect, inadequate music-making of performers.

However, it would be naively reductionist to argue that there is a single approach within mainstream WAM recording paradigms today. Some recording sessions are completely controlled and supervised by the producer, while others are less hierarchical, with musicians taking a more active role in the recording process. Sometimes, musicians even take the lead in telling producers and engineers how to shape their recordings. At the intersection of ideology, technology, media and messages, however, any decisions musicians, producers and engineers make about the recording process are ultimately decisions about what the music they record will mean. The acquiescence of musicians to engineers and producers, common in today's practice, will often result in recordings that fit a recording paradigm that values technological transparency. Due to our immersion in this culture of recording, however, many of us are unaware of the artistic and technological drawbacks of our approach. The result is that our recordings are likely to be less communicative, expressive and creative than they could otherwise be. Due to the technology we use, and the prevailing producer-dominated paradigm, thoroughly edited recordings continue to push performers towards the pursuits of transparency and conveying the intentions of the composer via literal adherence to the notated score.[114]

[113] Lindberg, "2L - The Nordic Sound."

[114] I am also mindful of cases where producer-led, transparent recordings go against adherence to the notated score. For example, I have often been involved in recording sessions where producers pursue neatness and tidiness at the expense of adherence to the notation. Such examples, however, only support my point about modern recordings often being less creative and expressive than they might otherwise be.

## 2.3) Choosing a Lo-fi Approach

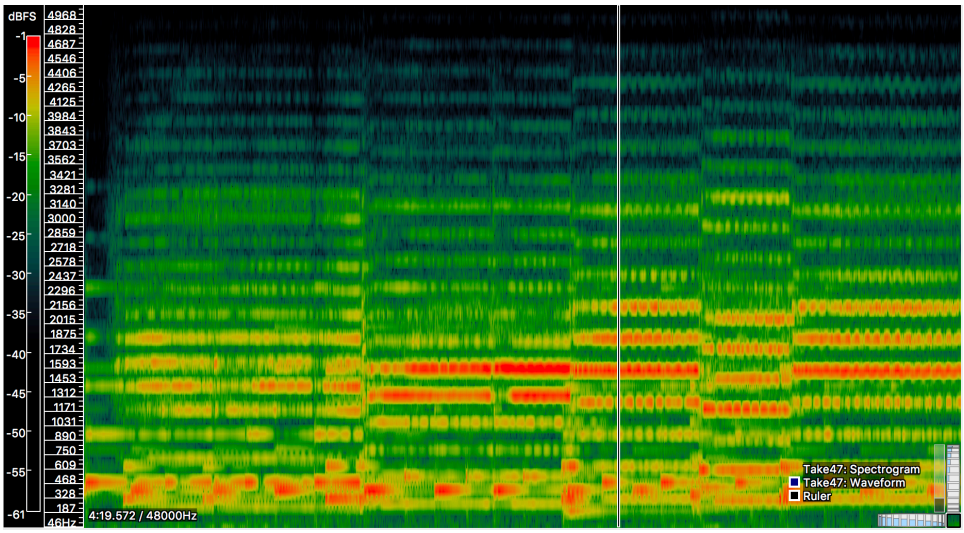


**Figure 2.1: Spectrogram of the opening bars of my recording of Schubert's *Du Bist die Ruh* (Appendix I - Recording 5.4.1) made with the lo-fi microphone.**

Together with sound engineer Geoffrey Miles of the Norwegian Broadcasting Corporation (NRK), I have taken an unconventional approach to recording in the documentation of this project. My recorded portfolio was made using Miles's self-built, limited-bandwidth microphone, which approximates the acoustic recording process by exclusively capturing the mid-frequency range of the sonic spectrum. I refer to this approach to recording as lo-fi because of the limited-frequency bandwidth that the microphone registers. The range recorded by the lo-fi microphone can be seen in the spectrogram of my recording of the opening bars of Schubert's *Du Bist die Ruh* (Figure 2.1). The vertical axis represents frequency in Hertz, while the horizontal axis represents the recording unfolding over time in seconds. The majority of the audio material recorded originates from fundamental pitches and lower harmonics (in red) between 500 and 2000hz, with fairly prominent lower harmonics between 2200 and 4500hz and higher harmonics above 4500hz barely registering at all. By contrast, Figure 2.2 is a spectrogram of a hi-fi recording of the piano quartet arrangement of Gustav Mahler's *Symphony* no. 3, from my CD *Symphonic Intimacy* with the Ysaÿe Trio and pianist Hanna Shybayeva.[115] Here, high audio energy is visible and quite evenly distributed up to 21.400hz and beyond, even after audio compression has been applied in order to format the recording for CD. The high amount of audio energy visible in the low frequency range below

[115] Gustav Mahler, *Symphony no.* 3, arr. Vassily Lobanov, recorded by the Ysaÿe Trio with Hanna Shybayeva, on *Symphonic Intimacy,* Dutch Record Company, 2015, DRC 15101501 (CD).

100hz is also notable when compared with the spectrogram of the lo-fi recording where the mid-frequency range is most prominent (Figure 2.1).

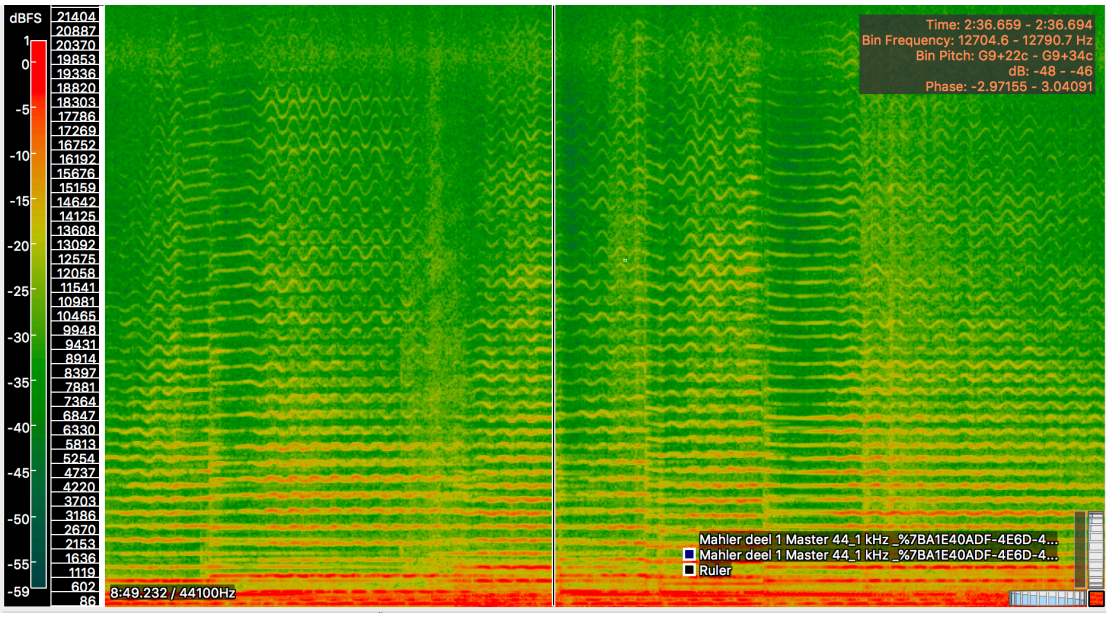


**Figure 2.2: Spectrogram from the hi-fi recording of the piano quartet arrangement of Mahler's *Symphony* no. 3.**

Due to its limited frequency range, lo-fi recording will not be perceived as transparent and, as such, it supports the all-in copying of early recordings: a process in which factors like neatness and tidiness (as emphasised in hi-fi settings) become necessarily subservient to elements of early-recorded style like portamento and un-notated tempo and rhythmic flexibility. I chose this medium for my recorded output because of its non-transparent sound, as well as its connection to historical acoustic recording. While lo-fi recording is not intended to be an accurate reconstruction of early-acoustic recording techniques, the sonic results attained convey information similar to that captured by the acoustic recording horn; the major difference being the absence of surface noise on our recordings. Not only does the unusual sound of these limited-frequency recordings make the listener aware that the recording medium is not transparent, but the recording process itself affects musical expression in a way that is fundamentally different from mainstream recording paradigms.

Both Miles and his late colleague, recording engineer Tony Harrison, were fascinated by how the audio feedback received during the recording process affected musicians. They realised that for most musicians, encountering their own recordings had a strong impact on their performance practice—one that could alter their approach to making music. They felt that mainstream recording, with its emphasis on transparency

and a large number of microphones recording ever-greater ranges of frequency, 'dehumanised' recorded sound and caused performers to emphasise neatness, tidiness, and notated detail. Miles observed that, as a result of listening-back to their recordings during mainstream contemporary recording sessions, musicians tended to pursue a clean and tidy performance style, focusing on precision, clarity, and unblemished purity of sound.[116] He felt that in such recording sessions, performers were under-emphasising momentary gestural information of the kind Daniel Leech-Wilkinson refers to as 'emotional-pictorial,' which he considers crucial to communicating music.[117]

Miles was thus encouraged to develop limited-frequency microphones in part because audio feedback from the mid-frequency range conveys different kinds of information to performers than hi-fi audio feedback. Miles observed that mid-frequency range feedback helped musicians focus more on shape, gesture, and musical character. My own experiences in working with the lo-fi medium has confirmed this.

### 2.4) Listening-Back

For this project, Miles and I focused on copying early-recorded style; that is, we concentrated on capturing the sound and atmosphere heard on the original historical recordings. Pioneering recording expert Fred Gaisberg (1873 - 1951), who made many of the early Edison recordings, was an inspiration for Miles's exploration of lo-fi recording technique. Gaisberg realised, in the early days of recording, that the atmosphere of the recording session had a significant effect on the sounding result.[118] Specifically, a single musician or group of musicians gathered around an acoustic recording horn in an intimate setting created an atmosphere that encouraged the intimate music-making we hear on many early recordings. Miles and I created a similarly intimate atmosphere around his lo-fi microphone in intimate spaces at the NRK studios and in several domestic music rooms in The Netherlands. Our goal was to achieve a similar atmosphere to an early recording session by using small spaces that emphasised physical closeness. I also wanted to better understand how the recording environment might have influenced the playing of early-recorded performers, and I documented how the process changed my own approach, as discussed in detail in Chapter Five.

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[116] Geoffrey Miles, e-mail to the author, January 9th, 2018. See Blier-Carruthers, "The Performer's Place in the Process and Product of Recording," for further discussion of this phenomenon.
[117] Leech-Wilkinson, "Recordings and Histories of Performance Styles," 252.
[118] Fred Gaisberg, *The Fred Gaisberg Diaries Part 1, USA and Europe 1898-1902* (Recordingpioneers.com, 2010), accessed June 14, 2018, http://www.recordingpioneers.com/docs/GAISBERG_DIARIES_1.pdf.

Our recording process involved listening-back, comparing my recordings to the originals, and experimenting with my approach to sound production, with proximity to the microphone and, with performance style. This was followed by further listening-back, leading to further adjustments and a deepening focus on the general atmosphere of the performance. Miles's verbal feedback directed my attention towards the atmospheric features of the original recordings, encouraging me to focus on expressivity rather than accurately copying details. Ironically, by broadly focusing on expressivity during the copying process, I often ended up copying details such as phrasing, portamento, and rhythmic flexibility more accurately than when my focus was directed to such details.

Generally I found that the mid-range-frequency feedback from the lo-fi microphone overturned the customary approach to making recordings, with elements like phrase shape and rhythmic flexibility becoming the central means of expression because other elements, like dynamic range and nuances of timbre, were captured more narrowly. For the recorded portfolio I often chose second or third takes of works, made after my performances had been influenced by listening-back, reflection, and adjustment. By contrast, the feedback I tended to receive when recording in mainstream modern settings encouraged me to focus on accuracy and precision of intonation, articulation, purity of sound, and preciseness of ensemble. Here, details of intonation and small blemishes in tone tended to take on great importance, with the microphones creating the impression of 'objectivity'—thereby further heightening my concerns for accuracy.

My copies of historical recordings include stylistic materials typically excluded from mainstream recordings, as well as RIP and HIP performances, and as such, go beyond the pick-and-choose approach of some performer-researchers. At the same time, they can be heard as 'spiritual' reproductions rather than literal copies, and I acknowledge that even if my goal were to create carbon copies of early recordings, this would be impossible. While my performances may depart in some ways from the originals, the central elements of early-recorded performance style are captured.

My goal throughout the recording process was to inhabit the communicative expressivity of the originals, regardless of whether the details of my copies precisely matched their source material. While the exact tempo, timing and timbre of my recorded copy might not literally match Oskar Nedbal's performance of *Du bist die Ruh*, it does convey a sense of intimacy and freedom similar to that of the original. Although the main focus was on expression, I made sure that my recordings also demonstrated clear

use of early-recorded stylistic devices like tempo and rhythmic flexibility, portamento and rubato, thereby ensuring that my performances were not held back by the ideologies of MSPs.

The lo-fi approach to recording can be viewed as a rejection of the mainstream recording paradigm, where the record producer's goal (as stated by Lindberg above) is to defend the composer's intentions. As Miles describes it, his goal is to instead capture the 'possibilities' contained in a musical event. He compares the musical event to a river and conventional recording approaches to cartography, in which the sketch of a river ignores the possible paths it might otherwise have taken. Instead, as Miles insists, the flow of the musical event should be viewed as consisting of an infinite number of points, whereby in each fraction of a moment a different perspective on its possible paths might be experienced. This metaphor is rooted in the belief that the power of acoustic music resides in its potential to diverge at any moment. This has an analogy in early-recordings-inspired performance practice. Early recordings often sound like live, one-off performance events, precisely because of this sense that what is recorded is but one of a myriad of possible directions a performance might take. This then gives the listener the sense that the next performance by the same performer(s) would likely take a different path. This is also what Leech-Wilkinson means when he describes early-recorded style as moment-to-moment, because the style is open to divergent possibilities at each moment in time.[119]

As the aim of this project is the all-in copying of early-recorded style, the lo-fi recording process has been instrumental in guiding my performances towards gestural, moment-to-moment expressivity.

### 2.5) Technical Specifications

The whole of the recorded portfolio was made with Miles's lo-fi, self-built microphone. This microphone, which captures frequencies up to 4000hz while focusing strongly on the mid-range from 500 to 2000hz, was paired with two simple stereo microphones (miniature DPA 46D electric microphones), which capture a conventional frequency range up to about 18000hz in order to also create full frequency versions of the recordings. The whole recorded portfolio can thus be heard in two versions: Appendix I contains the 'raw lo-fi' version (lo-fi microphone only) and Appendix II

[119] Leech-Wilkinson, *The Changing Sound of Music*, chapter no. 8, paragraph no. 6, http://www.charm.rhul.ac.uk/studies/chapters/chap8.html.

contains the full-frequency version (lo-fi microphone mixed with audio from two DPA 46D microphones). The full-frequency mix was created by removing the mid-frequency range from the DPA microphones and then adding this information back in from the lo-fi microphone. This allows the listener to compare a more modern sounding version of the recordings with the lo-fi version. The mixed versions are also meant to give a sense of what the early recordings I copied might have sounded like had they been recorded with modern, full-frequency microphones.

As the entire recorded portfolio was made using feedback from the lo-fi microphone, however, the playing heard on both versions captures adjustments made for the 'raw' version. For example, on our recording of Tchaikovsky's *Andante cantabile* from his *String Quartet* no. 1, the cello pizzicati had to be played forcefully in order to be heard at all on the raw, lo-fi version and, as a result, in the full-frequency mix, these pizzicatti sound far too loud in the overall balance.

### 2.6) Technological Value of Lo-fi

While lo-fi recording can help create artistically compelling results, the approach also has clear technological benefits. Modern microphones are compromised in their fidelity to the mid-frequency range due to the need to reduce noise interference. A modern condenser microphone's back-plate is constructed close to the diaphragm in order to reduce this noise interference, which results in distortion in the mid-frequency range. Physicist Andrew Simpson describes this process as follows:

> The wide-bandwidth small diaphragm condenser microphone represents a fundamental compromise between noise performance and linearity, where the designer must decide whether noise performance or linearity is the priority. Commonly, as in cases where noise performance is critical, linearity is necessarily compromised by increased back-plate proximity.[120]

The process that Simpson refers to as 'compromised linearity' happens when the diaphragm of a modern microphone is operating at full frequency and hi-range frequencies (above 5000hz) interact with lower frequencies, creating what is called intermodulation distortion. This distortion is particularly harmful to the mid-frequency range (500 - 2000hz) where human hearing is the most sensitive. The higher the frequency range captured by the microphone, the worse this problem gets. According to

[120] Andrew Simpson, "Implications of Nonlinear Distortion in the Ultrasonic Capacitive Microphone, Why is the Wide-Bandwidth Condenser Microphone a Bad Idea?" (Poland: Simpson Microphones, 2009), 2.

physicist John Willet, "typically in the best-case scenario [such as a well-designed modern microphone] this approximately entails a doubling of nonlinear distortion for every doubling of frequency."[121] In other words, the higher our hi-fi becomes (in terms of frequency range), the worse this intermodulation distortion gets.

What Simspon argues is that the low-bandwidth microphones of the past, which captured a smaller range of frequencies, actually show a significant and measurable advantage over the modern, wide-bandwidth condenser microphone. This is because low-bandwidth microphones lack the audible-band non-harmonic products of ultrasonic intermodulation distortion. To better understand how non-harmonic intermodulation distortion works, Miles provided me with the example below, which is a spectral analysis of a typical orchestral recording done at the NRK using contemporary wide-bandwidth microphones.

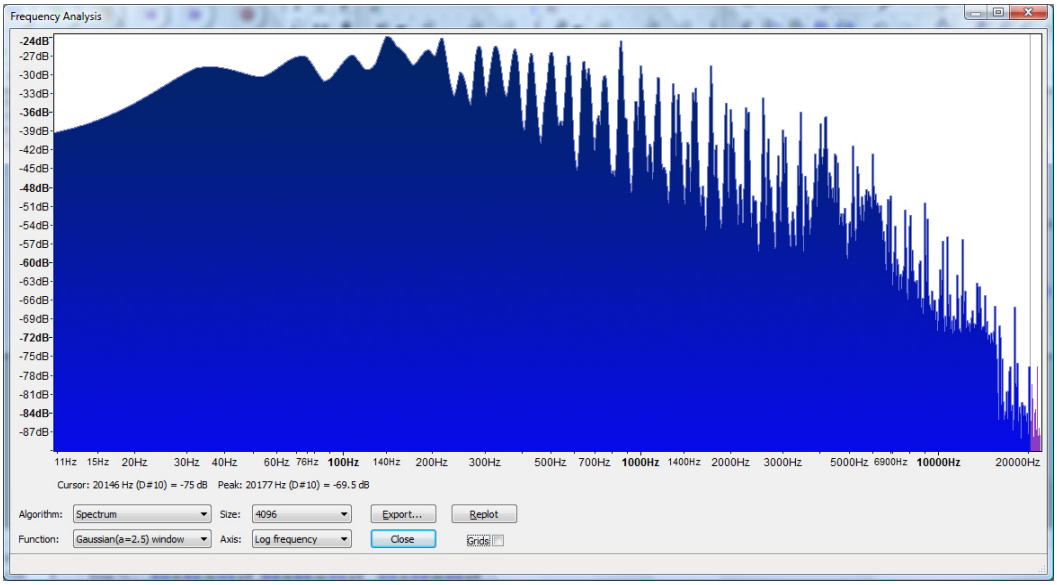


**Figure 2.3: Recording at the NRK of the Norwegian Radio Orchestra by Geoffrey Miles.**

The vertical axis represents loudness in decibels, and the horizontal axis represents frequency range in Hertz. The graph allows the reader to track relative loudness (coloured in blue) at each given frequency, as shown by the pitch events registered by the vertical lines. It is apparent that the bulk of the audio recorded is below (to the left of) 1000hz (in the form of fundamental pitches). This however is not the frequency range where the human ear gets most of its information. If one cuts off frequencies above

[121] John Willet, "The Symmetrical Microphone Capsule and the Quest for the Perfect 'Acoustic Window,'" AES UK 13th Conference: 'Microphones & Loudspeakers,' Paper Number: MAL-02, March 1998.

1000hz, the resulting audio becomes unclear and muddy, pitches are difficult to discern, and very little phrasing or rhythmic detail is audible. Contemporary microphone diaphragms, which are constructed to be equally sensitive to frequencies above and below 1000hz, have trouble representing the finer detail that occurs at mid-range frequencies (between 500 - 2000hz).

Contemporary microphones lose detail at mid-range frequencies due to intermodulation distortion that is caused by the capture of a great deal of low frequency information below 1000hz. Acoustically, a microphone diaphragm that is moving at a high amplitude and low frequency (i.e. loud, low audio input) will misrepresent low-amplitude, higher-frequency information (i.e. soft, high audio input) causing intermodulation distortion. This distortion results from the high-level (loud), low pitch frequencies modulating the higher frequencies and creating distortion side bands. Side bands are related to the distance between two frequencies and not the fundamental, therefore the distortion created is non-harmonic or 'out-of-tune.' While in a good quality microphone this distortion is low-level, Simpson, Willett and Miles all argue that it is highly significant because it interferes with detailed information in the mid-frequency range.[122]

Miles's self-built microphone solves the problem of intermodulation distortion by turning a dynamic microphone up and horn-loading it, making the microphone insensitive to low frequencies. Horn loading refers to the process of applying an acoustic horn to a diaphragm or membrane in order to transmit air vibrations. Figure 2.4 shows Miles's lo-fi microphone with its acoustic horns attached. As a result of this, the mid-range frequency information becomes clearer. This effect cannot be achieved electronically in post-production by selectively filtering out certain frequencies, because the mechanically-induced intermodulation would still be present in the filtered signal. An example of such an attempt at electronic filtering can be heard in singer Sarah Potter's recordings that were made with conventional hi-fi technology and later filtered in post-production to resemble early recordings.[123] Here, the mid-range frequency information remains distorted, and the result sounds more like a conventional recording post-compression than an acoustic recording. This demonstrates how the lo-fi microphone, with its lack of intermodulation distortion, records mid-range frequencies in a more detailed way than a conventional modern microphone.

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[122] Simpson, "Implications of Nonlinear Distortion in the Ultrasonic Capacitive Microphone," 3.
[123] Sarah Potter, *Changing Vocal Style and Technique in Britain During the Long Nineteenth Century* (PhD diss., University of Leeds, 2014), 151.

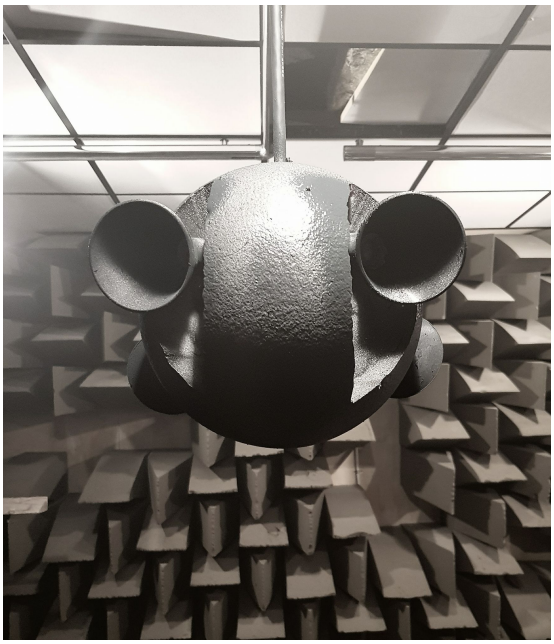

**Figure 2.4: Geoff Miles's self-built horn-loaded lo-fi microphone.**

Simpson equates the result of a lo-fi microphone's more detailed recording of mid-range frequencies with what he calls 'musicality.' He argues that the absence of non-harmonic components in the audible band makes historical recordings sound more 'musical' than contemporary recordings, and he believes that this musicality is achieved, not because historical recordings are altered by 'euphonic distortion' as is commonly believed, but because they are free of the non-harmonic distortions caused by intermodulation distortion.[124]

## 2.7) Time Domain Blurring and Depth

While these principles of acoustic science show that lo-fi recordings have demonstrable technological advantages, lo-fi recording is also based on making decisions about what information is important or meaningful to record in order to convey what Leech-Wilkinson calls the 'emotional-pictorial' elements of musical expression.

The acoustic recording horn has a strong resonance of its own, which produces 'ringing' or time-domain blurring. As Miles's lo-fi microphone is connected to an acoustic horn, it captures this effect. Time-domain blurring conveys information about

[124] Euphonic distortion refers to the theory that certain technological components of recording or playback distort the audio material and therefore add 'musicality' to the final result. For more information see Keith Howard, "Euphonic Distortion: Naughty but Nice?"*Stereophile*, 2006, accessed June 14, 2018, https://www.stereophile.com/reference/406howard/index.html. Simpson, "Implications of Nonlinear Distortion in the Ultrasonic Capacitive Microphone," 3.

depth and velocity in much the same way as an analogue colour photograph taken at a slow shutter speed does. The blurring colouration in these analogue photographs is like the sound the acoustic horn produces on early recordings. To illustrate, imagine photographing a scene where a large amount of red light is present, but there is a small amount of detail in blue light that is moving. The goal is to capture the motion of the blue light in as much detail as possible. Therefore, by taking a picture where the red light is filtered out and the blue light is blurred, the desired information will be captured. In this way, the lo-fi microphone cuts out the red light of low frequencies, shutting off information that prevents us from observing the blue mid-frequency information. The blurring resonance of the acoustic horn then helps us to better perceive the blue light or mid-frequency information in motion.

The musical result of this is the ability of the microphone to capture a great deal of information concerning gesture and phrasing, which is what I experienced while listening-back to my recordings. What follows then is that it is the mid-frequency range that conveys audio information that we perceive as gestural. Thus, the lo-fi recordings with their detailed mid-frequency information, and less-detailed lower and higher frequency information, engage the listener in a ways that are different from hi-fi recordings. McLuhan provides a theoretical framework for this process in his distinction between hot and cold media. McLuhan's idea is that a medium with more restricted information (for example, Miles's lo-fi microphone) engages an audience in a way that a medium with a high amount of definition cannot:

> There is a basic principle that distinguishes a hot medium…from a cool one...A hot medium is one that extends one single sense in high definition. High definition is the state of being well-filled with data…Telephone is a cool medium, or one of low definition, because the ear is given a meagre amount of information. And speech is a cool medium, of low definition, because so little is given and so much has to be filled in by the listener. On the other hand, hot media do not leave so much to be filled in or completed by the audience. Hot media are therefore low in participation and cool media are high in participation, or completion by the audience.[125]

In the context of our recording process, lo-fi recordings can be viewed as cool media, because they lack frequency bandwidth (data) and therefore encourage the listener to engage with them by filling in the 'missing' bandwidth with their inner ear. Hi-fi recordings can be viewed as hot media, because more frequency range is provided, leaving little to the listener's imagination. When listening to lo-fi recordings, we are

[125] McLuhan, *Understanding Media*, 22.

invited to imagine the frequency range of the live performance that became the recorded performance; what we are imagining, then, is not a hi-fi version of the same recording, but rather what its living reality might have sounded like. With a 'hi-fi' recording, however, the listener is bombarded by large amounts of sonic information, leaving little to be filled in by the imagination. Following McLuhan, the listener may be reduced to a state of apathy or low participation by a hi-fi recording. The effect of hi-fi therefore is impressive, big, and hyper-real, much like 4DX cinema, where the viewer is overloaded with impressions and easily reduced to a passive recipient of the experience. By contrast, lo-fi can trigger listener engagement by requiring them to imaginatively fill-in unrecorded sonic information.[126]

### 2.8) Using Technology to Problematize Technology

While the role recording technology plays in MSPs often goes unrecognized, I have attempted to use recording technique to problematize the relationship musicians have with technology. As the recorded portfolio demonstrates, lo-fi technology has advantages that, when used to further research and performance practices, can lead us away from MSPs and towards an early-recordings-inspired performance style. Imagine how different the recording of our emulation of the Haagsche Toonkunstkwartet playing Tchaikovsky's *Andante cantabile* from his *String Quartet* no.1 might be had it been made in a modern studio (Appendix I - Recording 5.4a19). The recording medium would have encouraged us to be more reserved in our use of the wild expressive devices central to the Haagsche Toonkunstkwartet's performance, and we would have likely been much more concerned with accuracy and cleanliness. The technology with which performer-researchers choose to record their artistic outputs thus plays an important role in encouraging them to either take a pick-and-choose approach to early-recorded style, or to fully embrace expressive devices that may sound professionally incompetent when compared to modern practices. Lo-fi helps liberate performers from these concerns, because the sounding results place far greater emphasis on gestural information than on neatness and tidiness.

The nature of lo-fi technology helps us better understand how historical recordings were made and offers us alternative possibilities for non-mainstream recording practices, while at the same time its technological advantages can engage

[126] "4DX Cinema," Cineworld, accessed August 11, 2018, https://www.cineworld.co.uk/4dx#more-about.

listeners' imaginations in a vibrant fashion. From my own recording process I have learned that the ways in which early recordings 'speak' to us reflect both the playing styles they capture, as well as the ways the recording medium focuses our ears on moment-to-moment gestural information. In sum, we as performers should be mindful that the recording medium we choose actively guides the message conveyed by our practice.