
In and out of the sound studio

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This article reports on the first phase of a four-year, multi-university Canadian research project called 'In and Out of the Studio'.¹ The intention of this project is to study the experiences and working practices of women sound producers in Canada, and to produce a multimedia computer installation and set of articles about their ideas, approaches and philosophies. We are studying gender issues that affect the work of these women in areas as diverse as film sound recording and post-production, sound engineering, radio art, performance art, experimental music, audio documentary production, and web sound. This is a wide range of disciplines, with their associated professional formations. What links the experiences of these diverse cultural workers is their focus on organising sound, and their gender. The first phase of the research focuses on formations: the following phase will concentrate on working practices through a discussion and analysis of specific recent works produced by the participants. The second part of this article explores the working processes of Hildegard Westerkamp in her composition of *Gently Penetrating Beneath the Sounding Surfaces of Another Place* (1997), through an interview with Westerkamp conducted in 1997. This interview will be used as a model for the in-depth studio interviews in the present study.

1. THEORETICAL CONTEXT

'In and Out of the Studio' arises from the consideration of theoretical issues that arose in two prior research projects, both of which focused on women composers and sound artists. Initially, I interviewed fourteen Canadian women composers of electroacoustic music about their experiences in this field (McCartney 1994). Subsequently, I focused my attention on the life and work of Vancouver soundscape composer Hildegard Westerkamp (McCartney 1999). Several theoretical themes emerged from this work.

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The language my consultants use to talk about musical technologies often seems to pull in at least two directions: towards criticism of mainstream ideas, structures and processes, and towards the imaginative creation of alternative contexts and productions. To describe this tension, I use the word (im)possible, a construction that has several meanings. Gayatri Spivak (1993) describes the (im)possible as that which 'one cannot not want', implying a desire which seems at once possible and necessary, while at the same time is perhaps practically impossible because of current political realities. I also use it to describe positioning. To be placed in an (im)possible position, as women sound producers are in a culture that defines both music composition and engineering as masculine, can also lead to openness to a wider range of possibilities, by imagining situations where these definitions are changed.

I argue that the discourse of the women composers that I interviewed in 1994, both in the language that they use to describe their work and in the sonic discourses of the work, suggests some different conceptualisations and desires from those of the mainstream. This research resulted in several articles that suggest different ways of understanding the language of electroacoustic composers in relation to the discourses surrounding work in the studio (McCartney 1995), comparative descriptions of composers' experiences related to common themes of negotiating access and initiating change (McCartney 1996) and an analysis of these composers' experiences in relation to the institutional structures of electroacoustic music (McCartney 1998). While the first study focused on the discourse of the electroacoustic studio, the present study also aims to consider the discourses prevalent in the music recording studio, radio station and multimedia lab.

2. GENDER PERFORMANCE AND INSTITUTIONAL CONTEXT

A prevalent theme from the earlier research is the notion of performing (Butler 1990, Callaghan 1995). Butler claims that gender is not a given, a biological necessity or determined social construct, but rather something that we perform, more of a mask than an essence. When a woman enters a field that is stereotypically masculine,

this troubles the stereotypical category. As an outsider either 'as a woman' or 'as a composer', a woman producer or composer may 'play' being the exceptional woman, or the stereotypical woman, and/or the 'genderless' composer, the technical expert, the audio engineer, the macho technologist. This role-playing can allow much greater flexibility and freedom in the definition of roles, if it is a consciously chosen strategy. At the same time, not all roles are freely chosen. Sometimes a woman may play these roles unconsciously, as a defence, alienating herself from parts of her life experience, as well as from other women creators. Others, unwilling to engage in such performances, might choose other career paths or forms of expression.

Sandstrom (2000) indicates that different approaches to the performance of gender exist in the profession of sound engineering, and further that the institutional context of the work (for instance, working in a traditional studio versus working for a women's music festival) does affect how gender is performed. 'In and Out of the Studio' compares several institutional contexts, to better understand how such environments affect the performance of gender. For instance, Ellen Waterman is studying gender relations at Trent Radio, a community radio station in Ontario, as well as at the annual audio art camp organised by the Canadian Society for Independent Radio Production, 'Full Moon Over Killaloe'. Karen Pegley focuses on the creative work of teenage girls in the classroom, as they are introduced to sound technologies as part of music education. Beverley Diamond studies the studio experiences of indigenous artists in Canada, and the working practices of two women who own a music production company in St. John's, Newfoundland. My research team in Montréal is interviewing women who work in scratch DJ performance, sound engineering, film production and multimedia production.

3. EDUCATIONAL FORMATIONS

Although, as the presence and work of these women indicates, it is not literally impossible for a woman to produce or compose with sound, my consultants often feel bracketed by environments that define the work as masculine. In the university context, women are not denied entry to courses and studios, yet I discovered through the interviews with electroacoustic composers that many of the women struggled to make a place for themselves within university electroacoustic music courses, where some believed that their compositional approaches were not valued. This is consistent with findings in other areas such as computer studies, in which Sherry Turkle and Seymour Papert (1990) note that traditional computer courses value an engineering-oriented, top-down, conceptual method rather than a 'bricolage' approach to programming that allows for improvisation and synthesis. Turkle and Papert note that

such a bricolage approach is preferred by many women, as well as some men, and that the restriction of teaching to the conceptual approach frustrates the bricoleurs.

In the present study, we are finding that participants have a wide variety of educational formations, with many women completing their training in apprenticeship situations, on the job in studios, at radio stations, and at live show venues, as is common practice in these situations. Here, access varies widely depending on the context. For instance, the campus/community radio sector in Canada, as opposed to the public or commercial sector, is uniquely mandated to serve diverse communities in the area of broadcast, and to provide access to and programming by groups not heard regularly on mainstream radio. Thus campus/community radio stations are intended to actively recruit women, people of colour, queer folk, community and social activist groups, etc., and to strive not only to provide a voice for these diverse communities but also to provide facilities and training. By the early 1990s, due in part to efforts by the National Campus/Community Radio Association, campus/community radio strove to eliminate barriers for women interested in radio, and to achieve gender parity on-air. At the annual general meeting and conference, a 'women's day' was established, where women from various stations would share skills and network, while the male conference attendees were provided with 'unlearning sexism' workshops. It is no surprise, then, that campus/community radio stations are a likely starting place for women interested in sound and seeking equipment, experience and community. The Canadian Society for Independent Radio Production has in recent years extended these possibilities for training through a series of weekend workshops for campus/community radio producers, and an annual 'audio art camp' focusing on creative work with sound. At this event, participants work intensively with two sound artists for a week at a wilderness retreat. The organisers invite both male and female sound artists to lead this workshop, and there has been a growing number of women participants each year, with the 2002 workshop achieving gender parity. At the same time, however, Ellen Waterman's interviews with participants reveal that although gender parity is sought with some enthusiasm at the national level, results at the local level are more uneven, with some stations resisting gender parity programmes.

In other situations, however, access is not institutionally supported in any direct way. For instance, women attempting to find work in private recording studios or wanting to work the live music show circuit often report gender discrimination. One woman (who now runs her own studio) said that initially, when she went to rent equipment at a music store to engineer a live show, she was told that women don't do sound production. When she persisted, the store employee wanted her to lift heavy equipment in order to prove that she could physically do the work. And in order to tip the scales

against her, he lifted up the other side of the box, so that more of the weight was at her end. Of course, in this situation, she was the client, and by continuing to insist, rented the equipment. This same participant stated that studio owners refused to hire her because they claimed that she would distract the other workers. Eventually, she was hired by one studio, but was never able to rise beyond the rank of assistant engineer, despite her abilities and technical skills. In such informal apprenticeship situations in small commercial establishments, there is often no specific policy on gender relations, so hiring and training are at the discretion of the management, who often rely on networks of association to find suitable candidates. If a woman is not admitted to, or is kept at the margins of such informal networks, she would need to be extremely persistent to achieve her goals, as my consultant was. But how many others would give up, being outside of the facilitating networks that others may be able to take for granted?

4. EARLY FORMATIONS

A significant difference between this study and the earlier one is that now we are asking participants to tell us specifically about access to and education about sound technologies during childhood. During the study with electroacoustic composers, I had begun interviews with the question, 'How did you become involved in electroacoustic music?' This naturally led participants to begin talking about their professional formation and university education. Beverley Diamond, discussing this project with me, expressed interest in technological, listening and music educational influences during childhood, and I agreed that this was an important area that needed to be considered. As a result, I decided to include such questions in the current study.

This area of questioning has led to some interesting insights and the identification of some significant trends. Gender theorists discuss how early socialisation tends to encourage gender conformity that constrains girls' attitudes towards technology: girls are taught to relate, and boys to tinker (Whitelegg 1992: 179–80). This childhood learning of gendered roles happens in the family home, playground, school and mass media. A morning spent watching children's Saturday morning television programming still reveals advertisements and programmes that encourage girls to see themselves as passive, warm, soft and caring, relating to soft toys and pink dolls; boys, as active, cool, hard and warlike, manipulating tools and machines ranging from cars to robots. This childhood gendering results in perceptions of the roles and abilities of men and women that affect what kinds of activities children are drawn to, value, pursue or are even willing to attempt. Lucy Green, in her recent study of the gendered discourse of music education, found that both teachers and students continue to perceive significant differences between boys' and girls' attitudes and

approaches to composition, with boys perceived 'as excelling at composition by virtue of being more imaginative, adventurous and creative' (Green 2002: 139). The girls tended to:

operate within conventional notions of 'femininity' . . . they opposed themselves to theory, using composition as a way of expressing their feelings . . . and even those who liked composition were prone to denigrate at least some of their own work in numerous asides when they described it as 'silly', 'boring', 'horrible' and 'terrible'. (Green 2002: 140)

Green also found that the myth of the creative genius as a male-only preserve remained virtually unchallenged in the schools that she studied. For many young girls, composition, like engineering or programming, remains a masculine preserve, and girls entering into such activities perceive engaging in them as a threat to their developing feminine role.

However, each person's socialisation varies, and some young girls have access to technologies and role models through their families or through other opportunities that allow them to imagine themselves as sound artists, composers and producers. One of our aims in this project is to find out where these opportunities exist, and how they can be encouraged. One woman, who is now a radio artist, relates the following:

(I was) maybe 10 . . . 9 or 10 . . . and I had a little tape recorder . . . I got it from my grandfather . . . I got a couple of tapes . . . my mother listens to CBC all the time . . . somewhere in the house are these tapes of me imitating Don Herron . . . basically conducting this morning show . . . interviewing these characters that I make up and do all the voices.

There are several important factors in this story that reveal its importance as a technical and creative opportunity. This young girl lived in an environment saturated with radio, since her mother listened to CBC, the national radio network, eight to ten hours a day. Her grandfather provided a tape recorder, and she was able to acquire tapes. Listening to CBC radio host Don Herron provided a model of how to conduct a morning show. Her mother clearly valued the productions, since she kept them for several years. The technology itself was simple enough for a child to figure out, and inexpensive enough that adults were not precious about it. All of these factors add up to an experience that gave this future radio artist more familiarity and confidence when she began to speak into a microphone and produce radio programmes as an adult.

Another participant, who is now a sound artist, says:

As I got into my teens my father started working at a college (teaching television and sound production) where he would bring home 4-tracks and video cameras and stuff like that, so I got to play with the 4-track quite regularly, which was another forum for speeding things up and slowing things down, and making multiple layers.

Here, a girl learns about using a four-track as an ordinary part of everyday life, having access to it regularly with a father who knows how to use it and is a teacher. In another case, a singer-songwriter who has also worked as a sound engineer, told me that when she was a child, her uncle gave her and her brother a four-track recorder and mixer. This same uncle was also a skilled sound professional, and passed on much technical knowledge to the children. Although I am not suggesting a simplistic technological determinism here, it is fascinating to note the persistence of practice from childhood: the radio artist remembers doing radio programmes as a child, the singer-songwriter talks of doing band recordings. As the project progresses, and we interview more people, it will be interesting to see whether such patterns continue, or perhaps whether such childhood experiences become more significant through retrospection.

5. WORKING PROCESSES

Many participants have spoken of the importance of visible and audible female role models in the field. If they were not able to meet these people (as is often the case), they wanted to find out more about their working processes. This led to my decision to include an analysis of a composer's working process in my Ph.D. dissertation about Hildegard Westerkamp. I have since found that sound students in communication studies and multimedia courses, as well as sound artists and audio engineers working in the field, also look far and wide for such sound examples of female role models.

At the doctoral level, I focused my attention on the work of one woman electroacoustic composer and sound artist, Hildegard Westerkamp. Part of the multimedia presentation included in my doctoral dissertation was entitled 'In the Studio', and was based on an interview with Westerkamp about the production of one particular recent work, *Gently Penetrating Beneath the Sounding Surfaces of Another Place*, which was made from sound recordings that she did in New Delhi, India in the early 1990s. The multimedia presentation allows one to hear individual sound files from this piece, to read our discussion of how she created these sounds, and to hear these sounds in excerpts of the completed piece, with a highlighted score to follow while listening. In addition, it is possible to view photographic images of the place of recording, and to read text about Westerkamp's approach to composing with sound technologies. Another part of the work presents visitors with information about my composition of a multimedia presentation based on a soundwalk. In this presentation, I discuss how I move from soundwalk recording to interactive multimedia movie. In both cases, the audience is introduced to the specifics of a working process through scores, sound examples and illustrated textual discussion. This multimedia presentation is online under the title of 'Sounding Places' at the Electronic Music

Foundation (<http://www.emf.org/artists/mccartney00/>). In the following section, I discuss Westerkamp's compositional process in the production of this piece, based on my interview with her. Readers who wish to hear some of the sound examples from this piece can go to the 'In the Studio' section of the Sounding Places website at emf.org.

6. GENTLY PENETRATING

The programme note for *Gently Penetrating*... discusses several important aspects of the piece: its focus on human voices through the environment that surrounds them, Westerkamp's approach to the sounds of New Delhi as a Western visitor, and her desire to express contradictions that she heard in the sounds and experienced in relation to the culture.

Gently Penetrating... focuses on the voices of market vendors and their acoustic environment in the streets and markets of New Delhi.

The vendors' voices in this composition were recorded in specific areas of New Delhi during my first visit in 1992: in the residential area of Januk Puri, at the early morning produce market in Tilak Nagar, at the market near the Jama Masjid, and at the market stalls just off Janpath near Connaught Place. I noticed that many of the other sounds in these places besides the vendors' voices were those of metal (such as buckets falling over, cans rolling, the handling of metal pots, squeaking gates, sometimes unidentified objects rattling or clinking as they pass), bicycle bells and scooter horns. As they seemed to be rather characteristic sonic 'accompaniments' to the environments through which the vendors passed or where they had their stalls, these sounds became major players in the composition. (Programme note, *Gently Penetrating Beneath the Sounding Surfaces of Another Place*, 1997).

This programme note is even more specific than Westerkamp's earlier pieces in its documentation of field recording locations. What all of these locations have in common is the presence of street vendors' voices. As Westerkamp notes, these voices change in relation to their surroundings:

The gruffer, coarser shouting of male voices seemed to occur in markets near noisy streets or where a lot of voices were competing with each other. The vendors moving through quieter neighbourhoods seemed to have musically more expressive voices and almost songlike calls for their products, with clear melodic patterns. And then there was the voice of the boy selling juice... (Programme note, *Gently Penetrating Beneath the Sounding Surfaces of Another Place*, 1997).

In this piece, Westerkamp balances this tendency of voices to change in relation to the environment by reversing it. She leaves the voices as they are, changing their surroundings to emphasise common points between the environment and the voices (for instance, changing the sound of the scooter horn to emphasise its vocal

nature, harmonising the slowed bicycle bell with melodic changes in a man's call). Westerkamp notes that the sounds of street vendors' voices are much less common in both North America and Europe. From her perspective as a visitor from the West, the presence of these voices in the soundscape seems magical.

Coming from a European and North American context, I was delighted by the daily presence of the vendors' voices. As the live human vending voice has disappeared almost entirely in Northern Europe and North America and has largely been replaced by media advertising, it is somewhat of a miracle for the visitor from those areas to hear such voices again. (Programme note, *Gently Penetrating Beneath the Sounding Surfaces of Another Place*, 1997).

Westerkamp experienced the soundscape and the culture of New Delhi as composed of contradictions that exist side by side, and she wanted to express these contradictions through her work. She heard the voices change in response to the shimmering, becoming more melodic, and to the grunge, becoming more gruff, and worked with these tendencies.

In a city like New Delhi, and other places in India, one experiences shimmering beauty and grungy dirt and pollution side by side all the time. These opposites are audible in most of my recordings as well and specifically in the sound materials selected for this piece. I wanted to express acoustically/musically both the shimmering and the grunge as it seems to represent so deeply and openly the contradictions within this culture and the intensity of life that results from it.

Finally I believe that this piece also explores outer and inner worlds as one experiences them in India: the extraordinary intensity of daily living on the one hand and the inner radiance, focus and stillness on the other hand that emanate from deep within the culture and its people, despite the hardships of life. (Programme note, *Gently Penetrating Beneath the Sounding Surfaces of Another Place*, 1997).

Gently Penetrating . . . explores inner and outer worlds, shimmering beauty and grungy dirt as much by meditating on what holds them together as by listening to what differentiates them. Although these paired terms inner and outer, beauty and dirt seem initially like opposites, the intensity of daily living in New Delhi is composed of the intermingling of both, emanating from deep within the culture.

7. COMPOSITIONAL PROCESS

In order to learn more about Westerkamp's compositional process, I visited her in August of 1997, and interviewed her in her studio about the production of *Gently Penetrating Beneath the Sounding Surfaces of Another Place*. The following discussion is a theoretical extension of the dialogue between Westerkamp and myself that began in that interview.

Hildegard Westerkamp's compositional process attempts to balance work outside and inside, field

recording and studio work, reflection and action. The process of composing a piece may take several years: for instance, *Gently Penetrating Beneath the Sounding Surfaces of Another Place* (1997) was based on source recordings made in 1992 and 1994, and most of the studio work was completed at Bourges in 1997. Also, during that period between 1992 and 1997, Westerkamp composed the *India Sound Journals*, which are related to this piece. She has added to the *India Sound Journals* since that time. Her compositions based on experiences in India were recently released as a CD, *Into India: A Composer's Journey*, 2002, by earsay productions (<http://www.earsay.com>).

8. FIELD RECORDINGS IN INDIA

The initial field recordings for *Gently Penetrating Beneath the Sounding Surfaces of Another Place* were done from September to December 1992 and in October 1994. Almost all of the recordings from 1992 were done in the context of a soundscape workshop with local residents, on days when Westerkamp went with workshop participants to particular areas (markets, neighbourhoods, etc.). Westerkamp notes that she would record several locations in one day. She thinks of some of the recordings as like soundwalks, whereas some are more like traditional still recordings:

At the early morning vegetable market I was moving all the time as well as at some of the other markets. So, I guess they could be called soundwalks in the sense of the moving mic. But they were not recorded like soundwalks, i.e. with commentary. In other words, I did not go out with the intention of recording a soundwalk, as the real characteristic of a soundwalk from my perspective is the mediating voice of the recordist. (Hildegard Westerkamp, interview with author, August 1997)

Note here that Westerkamp's definition of soundwalk and mine are somewhat different. For Westerkamp, the mediation of the recordist through her voice is what defines a recorded soundwalk (although she often prefers silent soundwalks when not recording). For me, the sense of human bodily motion in a soundwalk recording is what defines it. This still implies a certain kind of mediation, although it is not necessarily vocal. When someone records a soundwalk, moving through an environment at walking pace, they record the trace of their movements, and as a listener I can hear that someone is moving through a space. This moving trace of the recordist's subjectivity is what defines a soundwalk for me, while for Westerkamp it is also the presence of the recordist's voice, providing information about the place that is not audible. In still recording, the recordist's presence is less clearly felt. I feel the motion in *Gently Penetrating . . .* quite clearly, and sense Westerkamp's presence and perspective even though she does not speak.

In the programme note for this composition, Westerkamp thanks those workshop participants who took her to the places where she did the recordings.

I would like to thank Savinder Anand, Mona Madan, Arun Patak, Virinder Singh, and Situ Singh-Bühler for taking me to the places where these vendors' voices occurred. Without their help and local knowledge I would have had a difficult time capturing them on tape. (Programme note, *Gently Penetrating Beneath the Sounding Surfaces of Another Place*, 1997).

It is an important part of Westerkamp's compositional process to make contact with local experts such as these, particularly in a place such as New Delhi which was at the time unfamiliar to her. Their knowledge of the local soundscape introduces Westerkamp to sound environments that she might otherwise not encounter for some time.

9. IN THE STUDIO

Eventually, Westerkamp took the field recordings that she had made in New Delhi and began to work with them in the studio to create the composition. In my discussion of her studio work with field recordings, I focus particularly on the sound of a bicycle bell, a scooter horn, a sitar, and a bucket clanking. Westerkamp did not alter the sounds of the vendors' voices, but worked with many of the metallic sounds that she heard around the voices as she recorded them. This approach is consistent with her other work. When Westerkamp works with recordings of human voices, she rarely alters them to any extent. In *Gently Penetrating . . .* she uses long unchanged excerpts of field recordings that focus on the street vendors' voices, sometimes without any accompaniment of edited sounds, such as at the midpoint of the piece.

10. BICYCLE BELL SOUNDS

Westerkamp uses a recording of a bicycle bell, including several rings of the bell in a characteristic uneven rhythm as sounded by the cyclist in a ringing gesture (in other words, she did not isolate just one ring of the bell). Most of the sound files produced from the original bicycle bell are transformed primarily by altering their pitch, which in turn changes their speed. For instance, the original four rings of the bell, when altered to one octave lower in pitch, become twice as slow, and take twice as long to play.

In a multitrack sequencer, Westerkamp lines up the original with its pitch-shifted transformations, so that they begin at the same time. For a fraction of a second, all of the octaves sound together. Then, as each pitch-shifted version works through its evolution, they move into more complex harmonic relations to each other. The effect is to create what looks like a set of stairs on the

mixing screen, and sounds like a cascade. The original four rings were only a few seconds long, whereas this cascade takes almost a minute to play through. Because of the uneven rhythm of the original four rings, there is a random, liquid and spectrally colourful quality to this long gesture.

I just let it be an octave slower at the same time, which creates very interesting rhythms, and it becomes random. You're getting into the details of the gesture because it gets slowed down, whereas with the time correction option [altering the pitch but keeping the original rhythm and speed], it sounds more artificial. When the pitch is changed but the speed and rhythm stay the same, it is almost as if the rhythm doesn't fit with the pitch. (Hildegard Westerkamp, interview with author, August 1997)

The same process can be used to make the pitch higher. In this case, Westerkamp proceeds by semitones, since the initial pitch is already quite high. The high bell sound in my website example is from zero to seven semitones higher, while the very high bell sound is from eight to fifteen semitones higher. These pitches are then connected in descending sweeps from the highest semitone in the series, creating fast chromatic scales.

Another way Westerkamp alters the original sound is to use subtle modulation to create harmonic bridges with other sounds. For instance, the very low bell sound was modulated slightly to highlight different features of a vendor's voice.

One vendor approaches the microphone, and then as he moves into the distance, the pitch of his voice shifts. It's a subtle doppler effect. [Using the sound file of a bicycle bell pitch-shifted five octaves lower] I made a sound file a semitone either higher or lower. The bell as it was resonated with one part of his voice, and the modulated one resonated with the other part. (Hildegard Westerkamp, interview with author, August 1997)

One of the bell sounds is more radically altered. Westerkamp used gating, an electronic process that regulates the passage of a signal, to eliminate a large part of the reverberating part of the bell sound and emphasise the onset portion. The gate can be set to only let through the loudest portion of the sound. So, the sound becomes rather more 'wooden' in its timbre, as the metallic resonance and reverberation that occurs after the attack have been reduced. This sound is used alongside other bell sounds: you can hear it in excerpt two of the piece on the website. Westerkamp juxtaposes it with the other, more subtly manipulated, bell sounds to make a connection with its source. This is consistent with her aim to retain a connection between sounds altered in the studio and the sounds as originally recorded.

I want to retain those rhythms, sometimes small, sometimes larger gestures . . . they usually give me surprises. I like a certain amount of control, but I also like to work with what is already inherent in the materials. I receive them as gifts

from that place with which I can then play. I want to go inside this bicycle bell, but I don't want to lose sight of the larger context within which it occurs. I have to understand why I want to do it, otherwise I just don't do it. (Hildegard Westerkamp, interview with author, August 1997)

11. SCOOTER HORN SOUNDS

The sounds of motor scooters are prevalent in the New Delhi street ambience, so Westerkamp wanted to work with them. At the same time, she found the sound so unpleasant that initially she found it difficult to listen to.

I didn't like the sound at first. It was so ugly, I shrank away from it. (Hildegard Westerkamp, interview with author, August 1997)

The scooter horn mix includes the original with several lower octaves. It is used in the piece to highlight the scooter sound when it happens in the street ambience.

I start with the scooter horn going into that ambience, then include the mix exactly at that point. (Hildegard Westerkamp, interview with author, August 1997)

Adding reverberation to this sound softens the edges, and brings out its vocal quality.

HW: The way I mixed the [reverberation] and the original, the vocal part comes out more – the male voice, throaty, I knew I wanted that.

AM: Because it connected to the voice quality of some of the vendors?

HW: Yes, it suddenly connected to that, which I didn't anticipate at all, actually. (Hildegard Westerkamp, interview with author, August 1997)

12. CLANK SOUNDS

Westerkamp creates a 'clank mix' by searching through field recordings for various metallic sounds that are related in their 'clanking' timbre, such as a bucket falling over, the sounds of hand-operated machines, and metallic objects being placed on the ground. She also processes some of these sounds more radically.

There was one that I wanted to use but wasn't sure whether I should because it sounded more like my harmonies than those of India. I just fell in love with it, I had put it through a processing unit called the string modeller, and it was almost too much. (Hildegard Westerkamp, interview with author, August 1997)

The string-modelled clank sounds are used infrequently in the piece, like an exotic, strong spice that could overpower if your hand slipped. One can hear how this sound file is used in excerpt 2 on the website, near the beginning. This came from around the eleven minute mark in the piece. It appears briefly in the midst of a dense mix.

13. SITAR SOUNDS

I added the sitar sounds at the very end when the piece was basically finished. The sound colour of the sitar I perceive like a sound signature for what is typically Indian. It has a particular brilliance to it which occurs in the high frequencies of that sound. To emphasize that characteristic I filtered out all lower frequencies. When I had done that I had a sense of completion. I knew then that the piece was really finished. (Hildegard Westerkamp, interview with author, August 1997)

For a Westerner, the sound of a sitar immediately brings an image of India to mind, probably due to the use of the sitar in Western popular music. These sitar sounds were recorded in a music store. If you listen to the original sound, you will hear hammering in the background as a store employee makes an instrument. Westerkamp simply equalised this sound to bring out the brightness of its tone.

14. WESTERKAMP IN THE STUDIO: 'AN INTERESTING DANCE'

Westerkamp's work in the studio is strongly connected to the acoustic characteristics of the sounds that she has recorded, and how these relate to her experience of the place where she recorded them.

The structure of a piece always comes out of the materials and the way I work with them, through knowing a place for a long time . . . With any environmental sound, you are dealing with a given. Sometimes you want to impose something on it . . . and it won't let you. There is an interesting dance that happens between the materials . . . and your own compositional imagination. (Hildegard Westerkamp, interview with author, August 1997)

Westerkamp listens to the materials to decide how to work with them. This is similar to the way that some female scientists speak of their work with research subjects. For instance, Barbara McClintock, a geneticist, spoke of 'letting the material tell you', (quoted in Keller 1983: 179) and developing a 'feeling for the organism' that showed a respect for her research subjects, and a focus on their particular situation, that resonates with the way that Westerkamp works with environmental sounds. Donna Haraway's discussion of 'situated knowledges' (1991: 198) is also a useful touch-point for this approach, in its focus on the agency of research subjects, and Haraway's suggestion that the production of knowledge be considered as a conversation between researcher and subjects.

During the listening that Westerkamp engages in during studio time, she may hear things that were not apparent at the time of recording, but become obvious as she listens to the recordings again in the studio: aspects of the sounds that are particularly musical, evocative, connected to her experience of the place. Sometimes she will reflect on a piece for months or even years

before she is ready to go further, allowing the piece to come to fruition slowly. Then, she begins to highlight certain aspects of the recording by working with the materials. Often, she will take a certain sound gesture or fragment, work with it, then place it next to where she found it, by layering the original recording with the processed sounds. She creates harmonic and rhythmic bridges between sounds by listening to what they have in common. You can hear some of these processes more clearly by listening to the sound examples on the website.

Westerkamp refuses to stay in the position of technological controller, master of the universe. She listens to the local residents of a place to learn about their perspectives before composing. She records with a moving mic and responds to what she hears, as well as doing still recordings. She listens to the materials in the studio, in order to decide how to work with them. The resulting work retains a strong connection with the place of recording, while simultaneously playing in an abstracted sound world derived from it. This is neither a stereotypically masculine position of control over the world, nor a stereotypically feminine position of connection with the environment. Rather, it balances between these two poles and integrates them.

My interview with Westerkamp in the studio allowed me access to her way of working. She very generously provided me with sound files, scores, working notes and excerpts from the piece, to allow a wider public into the workings of her compositional process. In the present study, the next phase of my research will involve similar interviews with several composers, sound artists and producers, so that their processes can be revealed and understood more deeply, going beyond a stereotypical 'woman's way of working' into an exploration of the working processes of a wide variety of female cultural producers of sound, and an understanding of these processes in relation to contemporary thinking on gender and technology.

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