The Western Edge: some recent electronic music from Western Australia

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A survey is presented of developments in recent Western Australian electronic music, focusing on the geographical influence on local composers' work. The article follows specific cases of practitioners in the fields of Sound Art (Alan Lamb and Hannah Clemen), Live Electronics (Cathie Travers and the electronic music quartet Magnetic Pig), Interactive Electronics (Jonathan Mustard and Lindsay Vickery) and Noise/Lo Fi Electronics (Cat Hope and Lux Mammoth).

1. INTRODUCTION: CULTURAL AND GEOGRAPHICAL INFLUENCES

Western Australia shares with the western United States a tradition of not being traditional. Its capital and principal population base is the city of Perth, often touted as 'the most isolated capital city in the world'. It administers a state six times the size of Texas with a population of close to two million, for the most part residing in the capital's leafy suburban sprawl. Physical separation from the country's more politically powerful east and extreme isolation from the rest of the world has resulted in the flourishing of a great diversity of practices in the electronic music scene. The conventional wisdom (usually expounded in the case of the western United States) is that artists that develop in communities removed from European cultural centres feel relatively unbound by tradition and therefore free to explore their own preoccupations without the burden of the weight of history. While this is true in Western Australia's case, the additional factor of physical isolation has, to a degree, created an expectation that the community act as 'the whole world'.

The compensatory desire to remain connected has manifested itself in the West through a healthy number of forums for New Music. Perth has experienced a remarkably lively flowering of new music particularly since the mid-1980s through projects such as the Fremantle Festival of Free Improvisation (1985–6), Evos Music Series (1986–94), Club Zho (1998–) and Tura Events Company's Totally Huge New Music Festival (1997–).[1] These various projects have been principally the result of the work of Thomas (Tos) Mahoney, a strangely 'laid-back' entrepreneur with the skills to draw together disparate new music aesthetics and practices into a supportive community. As a result, during this period Perth played host to a diverse range of electronic music personalities, such as Stelarc, Amy Knoles, Jon Rose, Joel Chadabe, Warren Burt and Merzbow.

It is likely that isolation from specialist 'scenes' has played an important role in encouraging composers and sound artists to venture into a wider range of electronic music practices than might be expected for a community of less that two million. The desire to 'keep up' with developments elsewhere in the world also has the interesting effect of positioning the world in the role of a virtual unknowable 'other'. It is perhaps this sense that 'real music' is being made elsewhere, that incites many of the composers mentioned in this article to seek ways of expressing something 'authentic' in their work. These factors, in addition to the increasing rapidity with which ideas travel, has meant that this microcosm of the world contains much that is cutting edge, with an interesting mix of quirky local colour.[2]

2. ELECTRONIC MUSIC-MAKING IN THE UNIVERSITIES

Degree courses in music are offered at two Western Australian Universities: the University of Western Australia (School of Music) and Edith Cowan University Conservatorium. At the time of writing, neither university has a dedicated Electronic Music degree. An electronic music studio was set up in the early 1970s by Professor John Exton at the University of Western Australia. The history of this studio is not well documented, though a number of composers active at this time, such as Exton, Roger Smalley, Carl Edwards and Stuart Davies-Slate, produced work there.

More recently, Edith Cowan University has been increasingly active through its *Studio for Research in Performance Technology* (SRPT). Based at the WA Academy of Performing Arts Conservatorium, SRPT is a centre for exploration of new methods of controlling

[1]More information on The Totally Huge New Music Festival is available at http://www.totallyhuge.iinet.net.au/

[2]More information on Western Australian Composers is available through the WA New Music Archive website maintained by the author at http://waapa.cowan.edu.au/staff/lvickery/wanma.html

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sound electronically in live performance. It is coordinated by myself and since 1997 has hosted the work of a wide variety of composers, musicians, actors and dancers, including Cat Hope, Jonathan Mustard, Cathie Travers, Hannah Clemen, Alan Lamb, Vferver, Rachael Dease, Buzz Dance Company, Danielle Micich and Melissa Madden Gray. SRPT maintains a consistently high profile through the public presentation of work in both Perth and overseas, producing work for all the many local New Music events and taking part in international initiatives such as Jesse Gilbert and Scott Rosenberg's international 'Finding Time' live Web broadcasts.

3. SOUND ART

One of the more immediately identifiable and successful examples of the 'interesting mix of cutting edge with quirky local colour' is the work of sound artist Alan Lamb. His powerful assemblages of the naturally resonating sounds of long wires have more claim than most music to be a 'music of the spheres' – utilising modern recording techniques to listen in on what Stockhausen calls the fundamental element of the universe – vibration – in one of its purest forms. Lamb clearly views authenticity as an important element in his personal aesthetic.

> For me, wire music has always been a real music in a number of senses. One is that it is created by natural forces – the action of the wind on wires, but also because the actual music produced by the wires is natural, in the sense that it must obey fundamental laws of physics, because we are dealing with such a simple physical system.[3]

These eerie, slowly unfolding soundscapes have predictably drawn comparison with the Australian landscape itself. While it is true that Lamb does have an affinity with the open, sparse Western Australian outback (he has recorded in remote locations such as Wogarno Station near Mount Magnet, and the 'Faraway' farm in the Great Southern region of the state), he traces his interest in the sounds of long wires back to his childhood in Scotland.

> On walks into Dunning with the five-year-old Lamb (his nanny) would put her ear to the telephone poles to 'hear the sound the world made'.[4]

The intriguing story of the development of Lamb's 'wire music' is well known and thoroughly documented in Jenkins' excellent *22 Contemporary Australian Composers*.[5] Lamb's philosophy and aesthetic concerning his music is also fully fleshed out both in Jenkins' article and his own 'The metaphysics of wire music'.[6] His consideration of the many implications that flow from his music has more recently drawn him in a number of directions.

One of these is a project begun many years ago based on the interactions between electronic 'infinite music machines' – which generate sound in hair-fine wires by electronically timed pulses in magnetic fields – with kinetic sculptures based on light and moving water. The result is a self-generating and evolving music which is continuous and never repeats itself. More recently, Lamb has begun exploring the potential for using the sounds as samples for generating music using ProTools and MAX MSP, first hinted in Jenkins' article:

> The way to achieve this in the case of collectively improvised wire music will involve computer-assisted storage, recall and mixing and the incorporation of the newest communications and information technologies.[7]

A collaboration with British electronic musician Kaffe Matthews in 2000 perhaps acted as a catalyst focusing Lamb's attention again on the prospect of a 'collectively improvised wire music'. Their performance at Perth's Club Zho used STEIM's LiSa software[8] to allow live sampling and triggering by violinist Matthews.

Lamb sees the shift in his method of performance from linear stand-alone works towards stated as driven by, but also capable of helping to drive, the development of new technologies.

> . . . the sheer complexity of the sounds which made them so much a music in their own right will provide an interesting evolution in the genre of computer generated music-from-sound-samples.[9]

Perhaps the most radical of Lamb's current projects is being developed in collaboration with composer/sound artist Hannah Clemen. Their proposed *EEG Music* project comprises a method by which a subject's brainwaves are transposed and amplified into the audible range, thus creating a music that is generated by thought alone. Again it is possible to trace an influence back to Lamb's preoccupation with the 'natural' or 'real' qualities of wire music.

The *EEG Music* project will operate in the following way:

> A standard EEG machine is used to record the brainwave frequencies, and this data will be fed into a computer using

[3]Andrew McLellan (1989) in *SOUNDS AUSTRALIAN*, Winter 1989, pp. 24–6. BEHIND SKY SONG extracts from a discussion led by Andrew McLellan of the ABC with composer/performers Sarah Hopkins, Alan Lamb, and choreographer/dancers Beth Shelton and Ian Ferguson.

[4]John Jenkins (1988), *22 Contemporary Australian Composers*, p. 107–14. Melbourne: NMA.

[5]*Ibid.* pp. 107–14.

[6]Alan Lamb (1991), Metaphysics of Wire Music. *New Music Articles Magazine*, Volume 9, pp. 3–6, 30.

[7]*Ibid.* p. 112.

[8]LiSa is a realtime sampling and audio manipulation environment that runs on the PPC Macintosh platform (http://www.steim.ni.lisa.html).

[9]Author's correspondence with Alan Lamb.

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> a piece of custom-designed software to amplify the very weak signals, and to transpose them by several octaves. A filtering system will be used to isolate the frequencies of the brainwaves and to filter out the unwanted noise.[10]

It could be argued that such a project aims at a similar authenticity to that of Wire Music: whether evolution has equipped us with the mechanisms to perceive the fundamental qualities of our own brainwaves is still unknown.

Beyond the relatively straightforward process of transforming brainwaves into audible sound, Lamb and Clemen have anticipated a number of pathways in which their research might be directed.

> The *EEG Music* project also extends to the examination of feedback effects where [seeing how a person's brainwaves are affected by the sounds they have just generated] as well as group performances, in which people 'communicate' through the sound of each other's minds, are both ideas that will form a much later stage of the project. As a person becomes more familiar with the 'music' of their own mind, they can be trained how to manipulate the sounds, to create different kinds of music reflecting their different emotions and states of mind.[11]

The *EEG Music* project brings together a number of Lamb's professional activities: as a composer, a neurologist and as a general practitioner. Interestingly, his aspirations for the project include its potential as a tool to heal mental and physical illness, an aspiration he shares with Clemen.

> I am interested in the application of sound as a healing medium, both for physical and mental disorders. It is becoming clearer that certain frequencies and rhythms, either alone or combined, affect the mind and body, not to mention the affected social/cultural responses to particular kinds of music . . .[12]

Through her research and collaboration with Lamb, Clemen hopes to join musical and medical (both ancient and modern) technology in a fusion of concept and practice.

Clemen is herself an accomplished sound artist who began developing her technique using analogue four-track recorders and more recently ProTools. Although she has – and does – use synthetic sounds, she tends to prefer real sounds, sampled from the immediate environment or through the manipulation of objects. Clemen has always had an interest in the nature of sound and sound combinations, and how the harmonic structures affect the listener psychologically and physically.

4. LIVE ELECTRONICS

Composer Cathie Travers has been working in the field of electronic music since the late 1980s. Her principal medium to date has been live electronics – partly a reflection of her background in rock music. Although she has been composing using four-track tape since the age of thirteen, her exposure to the world of MIDI initially suggested to her the possibility of a new musical renaissance.

> One of the big things about having a MIDI studio for me is that it is literally like having an orchestra. I'm insanely jealous of someone like Haydn who literally did have an orchestra there to rehearse his music and listen to it. Just having so many colours at your fingertips, that's the biggest appeal of it for me . . .[13]

Almost all of her concert music, from early works such as *Antarctic Defeat* (1989) through to her current *Utopia Dissolve* opera in progress, uses live performers in conjunction with electronics.

For Travers, electronic instrumental timbres are also fundamental to the act of composition.

> I use instruments to improvise with; find the material that I think suits them; generate some material; and then sit down with paper and work things out from there.[14]

Travers, a virtuoso pianist, has performed with all of the contemporary music groups in Perth. But Since 1992 her principal affiliation has been with the electronic music quartet Magnetic Pig, which she founded along with composers Iain Grandage, Paul Tanner and myself. Musically, the group is best described as 'Totalist', a term coined by New York critic Kyle Gann, in that they reflect the influence of a wide variety of musics, including various sub-genres of classical new music, jazz, pop and world music. But by far the clearest unifying influence on the group has been the inclusion of electronics into their live performances.

Magnetic Pig have developed the use of technology in performance in a number of ways: voice writing for synthesizers – particularly in relation to pressure/timbre sensitivity – as exemplified by Travers' *Bent Funk* (1992–4); adaptation of industrial-techno in Travers' *Urban Artifacts I* (1991); an extension of the keyboard soloist's sound-triggering possibilities via foot-pedals, MEP4 and MAX patches in Travers' *Alyx-er* (for piano + sampler, 1999), *Steel Vultures* (for voice, accordion, synths + MEP4, 1997–8), and *Armagheddon II* (for multiple synthesizers, 1994); effects processing of live instruments has featured in Grandage's *Reptiles* and *The Curve* (both for cello/effects and tape, 1993 and 1994, respectively) and my *Dicegame* (clarinet and effects processor, 1995) and *The Giant is Speaking Through You* (electronic and acoustic percussion/effects and tape, 1991); live computer/performer interaction in Jonathan Mustard's *RoboSax* series (electronic wind controller,

[10]Author's correspondence with Alan Lamb.
[11]Author's correspondence with Alan Lamb.
[12]Author's correspondence with Hannah Clemen.

[13]Lindsay Vickery (1993), Moving Window: an interview with Cathie Travers. In C. Meyer-Homji (ed.) *Soundscapes* **1**(2). ISSN 1039-1312.
[14]*Ibid*.

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computer and synthesizers, 1990–), alternate MIDI contollers (the Joy-Stick Cello, Vickery and the interactive Twister Mat, Mustard) and interactive multimedia in my *noir* (MIBURI MIDI jump suit, 505 drum machine, tenor saxophone, piano, samplers and MIDI-controlled lights, 2000).

The transition to multimedia works is also evident in Travers' latest project (in conjunction with performance artist SiN), the cyperpunk opera *Utopia Dissolve*. Travers is an avid SciFi reader and active 'Netizen' – like many in isolated communities, the virtual world proposed by SciFi is clearly appealing to her. Influenced by cyberpunk, the SciFi off-shoot genre popularised by William Gibson, Bruce Sterling and others, Travers describes the work as being:

> . . . the realm of hi-tech, and the modern pop underground, visionary fluidity and street-level anarchy. The characteristic features are: 'personalised' miniature tech; the 'third-stream' individuals living outside of mainstream society; nano tech; brain/computer interfaces; interzones where the street finds its own use for stuff.[15]

In performance this translates into a cast of live and virtual characters, and sometimes synthesised amalgams of live characters. The live component is performed by Travers, SiN and Magnetic Pig, all of whom have dual roles as cast and musicians. Interestingly, Travers has devised a structure for the work not unlike that of Stockhausen's *Licht* Cycle, in that the complete opera comprises a number of stand-alone works that can be performed as concert music prior to *Utopia Dissolve*'s completion. This is perhaps another reflection of the pragmatic approach dictated by a desire to create large-scale works within the context of a small community.

5. INTERACTIVE ELECTRONICS

The desire to create large-scale works of textural and compositional complexity that are able to be generated by a solo performer has led composers such as Jonathan Mustard and myself in the direction of interactive electronics. Since 1990 we have been creating a body of work for solo wind instrument (acoustic or electronic) and electronics. Mustard is a highly inventive composer whose music ranges from traditional concert music, through interactive works written in the software MAX (including a MAX version of the game *Twister* with an interactive mat), to music-theatre works involving party whistles. A strong engagement with social issues, perhaps amplified by isolation, informs many of Mustard's works.

Mustard's Automaton series from the late 1980s used chaotic phenomena called 'cell automata' to generate musical material which he then distributed between a solo wind instrument and an accompanying electronic tape.[16] In a second series begun in 1990, grouped under the satirical title *RoboSax*,[17] he expands this paradigm, exploring elements of interaction and control between the performer and machine. Typically, Mustard positions the dynamic created in these works within the wider social context:

> They are the protagonists in the drama or perhaps the dilemma of 20th/21st Century existence where the interaction of humans and machines (computers in particular) is ubiquitous and the question of which element in the equation has the control at any one time becomes ambiguous.[18]

In *Robosax I* (1990) for MIDI wind controller and two computer-controlled Yamaha TX81z synthesizers, the computer running MAX has the upper hand – sending patch changes while issuing performance instructions to the soloist. The instructions give the parameters for a meta-composition by outlining the contours for the performer's improvisation, for example:

> Average dynamic: p
> Note played most often: A3
> Average note duration: 1/4
> Octaves played most often: 2 & 3
> Texture: sparse, pointillist staccato, with many rests
> Motion/direction: nil – fidgeting around a point[19]

The stream of MIDI information generated by the live performer is realised through the filter of the computer's continuous alteration of synthesizer patches. Mustard's ingeniously programmed patches add to the computer's ascendancy confounding the performer's expectations by reordering and/or harmonising the pitch of each key or changing sounds with each new rearticulation.

Robosax III (1996) operates according to the opposite model, where the performer is in control of most of the musical parameters, but is faced with the arduous task of controlling not just their own instrument, but up to seven other virtual instruments at the same time. In addition to making choices about their own playing, the performer must direct the computer via a MIDI footpedal controlling harmonic, timbral, tempo and several other MIDI controller parameters. *RoboSax III* also addresses one of the central problems of electronic music by taking the step of standardising the equipment required to perform the work: a MIDI footpedal, a Macintosh capable of running MAXplay and a general MIDI synthesizer.

[15]More information on Magnetic Pig is available at http://www.magneticpig.iinet.net.au/

[16]This series of works is discussed in detail in: Jonathan Mustard (1991), Chaos Music. *New Music Articles Magazine*, Volume 9, pp. 3–6, 30. NMA.

[17]Alluding to Paul Verhoven's 1987 film *RoboCop* and the spin-off series that followed it, Mustard both references and satirises his own interest in the film's central theme, Man's increasing intergration with machinery. At the same time he draws attention to the parallels between composers' and film-makers' tendency to create series of related works under the same title.

[18]Excerpted from the programme note for *RoboSax IV*: 'The Arsonist' (2000), published by Magnetic Pig Productions.

[19]Excerpted from the score for *RoboSax I* (1990), published by Magnetic Pig Productions.

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The most recent addition to the series, *RoboSax IV* 'The Arsonist' (2000) sees Mustard opting for the compromise position of joint partial control between the soloist and the computer. In some respects, the performer (alto saxophone) playing from a notated score and the computer (running MAX MSP) playing samples according to a script, go about their own business. However, Mustard sets up a feedback loop in which audio via microphone from the live performance modulates both the characteristics of the computer's samples and its own input via filtering to create a third stream. The resultant modulations of the computer's audio in turn influence the live performance. Elements of chance resulting from the use of some graphic notation and relatively free timing in the score and use of random number generators in the script, elevate the work into a region somewhere between freedom and control.

Another work in this series for solo wind and interactive electronics is my *27matrix* (1995), an interactive improvisation environment written in Opcode's MAX software. An improvising soloist (wind controller, such as the Yamaha WX7) provides the raw MIDI data that is transformed by MAX in real time into various structures. These structures are governed by a principle of self-similarity in that all material created by the computer in some way reflects a nine-digit cypher (532214451). *27matrix* combines live improvisation with the sort of formal processes that I had been using in my music to varying degrees between 1990 and 1995.

27matrix employs five basic environments that are organised in the cypher structure mentioned above. They employ a number of different strategies to transform the live MIDI input from the wind controller, each reiterating the cypher structure in the pitch and/or rhythm domain. Some examples of these processes are: an inversion of typical jazz improvisatory practice in which pitches from the performer's improvisation are used to create harmonies in rhythmic canons; and an environment where the soloist's notes trigger repetitions – higher velocities give more repetitions and lower pitches give slower speeds; the performer's improvisation is harmonised – with greater velocities being harmonised with more notes.

An increasing involvement with video, lighting and texts in my work has led to a desire to expand the techniques developed in *27matrix* and to develop models of interaction that are based on memory and derive meaning from an interplay between different modes of defining reality. The first work in this series *<as viewed from above>* (2000/01) is written in MAX/MSP and 'listens' to the live performance of an acoustic instrument as a trigger for proceeding through the samples of a text. The computer can choose to replay and manipulate any line of text that has been previously chosen, but is constantly narrowing its own number of text choices. In effect, the patch left to its own devices will choose to 'obsess' over – in this case repeating and deforming – an ever-diminishing group of samples. The input from the live performance 'distracts' this process and forces it to act upon new material until all of the samples have been exhausted.

New structural models need to be developed in order to consolidate on the possibilities afforded by interactive nonlinear technologies. Central to this project is the development of an understanding of process by which people manufacture meaning. A model based on the current understanding of the structure of consciousness is now more plausible through the use of interactive mulitmedia that allow the realtime control of many of the typical components of human experience: sound, image, text, etc.

My current work in progress, *a throw of the dice can never abolish chance*, is a collaboration with video artist Vikki Wilson. In this work, the movements of a dancer transduced via the Yamaha MIBURI MIDI jump suit will cause the computer to act upon a variety of 'contents' – such as still and moving images, written and recorded text, sound 'effects', music, lighting, etc. The computer's responses will be scripted according to a number of different memory-based paradigms. The development in interactive technologies has been very rapid and has resulted in many unstable presentation platforms. Another important aspect of the work will be to create a robust system that integrates developments in contributing image, audio and interactive technologies into a stable, portable and relatively inexpensive system.

6. NOISE / LO FI ELECTRONICS

Another important phenomenon in the electronic music scene in Perth has been the growth of activity in the field of noise music over the last several years. This activity has focused itself into the collective 'Collision Course', founded by Cat Hope and Claire Pannel. The group comprises a surprisingly large number of noise artists and a very active e-mail list, and has begun holding regular performance events.

The most active figure in the noise scene is composer Cat Hope. She is a classically trained flautist and both wrote for and organised a 'classical' New Music group, Limit of Maps, during the 1990s. However, she claims that the move into the noise scene, with her 'two bass guitars and a vacuum cleaner' group Lux Mammoth, was always a latent in her work.

> I had been listening to noisy bands for years – I always loved bands like the Butthole Surfers (my favourite still today) and Psychic TV, and I was very much into punk stuff. I actually help set up WA's first 'punk' radio show on 6UVSFM (now RTR). All this whilst studying flute at university, seeing them as very separate worlds. But I was, and always have been, bass crazy.[20]

[20]From the author's interview with Cat Hope: http://waapa.cowan.edu.au/staff/lvickery/chint.html

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Lux Mammoth, formed with bass player Al (Dr. Alien) Smith, has since branched out from the basses/vacuum cleaner format, although the use of 'domestic' noise is still very much part of the group's aesthetic. The use of aurally interesting but familiar sound sources was the basis of the group's performance *Tools* (2000), where a variety of amplified power tools were processed via analogue electronics and sampled to produce an overwhelming wall of sound. *Tools* followed and built on their 1999 performance *In its own Blood*, which used contact microphones to amplify the dismembering of a cow's rib-cage. The explicit portrayal of violence and cruelty (in this case augmented by the projection of a video of a highly immoral dental experiment from the 1950s) is at the heart of many of Lux Mammoth's performances. The use of extreme volume, particularly in the low frequencies, does much to reinforce the physical, in addition to the intellectual response to the experience of Lux Mammoth's performances: it is felt by the body rather than the ears and head. In the case of *In its own Blood*, the performance becomes a simulcrum of the violent act itself, focusing the audience on the (in fact unconnected) live sound and transforming it into a potent and horrific aural symbol of the images.

Despite its almost diametrical opposition to the work of Lamb and Clemen (music as a force to sooth and heal as opposed to one to jolt and provoke an engagement with reality), the performances of Lux Mammoth share something of the *EEG Music* project's yearning for authenticity or some expression of 'real' experience. It is the condition of most modern societies to be cushioned by our own readiness to accept the maximum number of comforts affordable. It is possible to view many of the preoccupations of these composers as a revolt against the phoney nature of much mass-media culture. The physical isolation and the short history of Western Culture in Western Australia tend to amplify these qualities, but have also had the interesting effect of concentrating composers' and sound artists' desire to find something that is still worth expressing.

REFERENCES

Bolleter, R. (Guest Editor) 1991. *New Music Articles Magazine*, Volume 9. Melbourne: NMA Publications.

Jenkins, J. 1988. 22 *Contemporary Australian Composers*. Melbourne: NMA Publications.

McLellan, A. 1989. BEHIND SKY SONG. *SOUNDS AUSTRALIAN*, Winter issue, pp. 24–6 Sydney: Australian Music Centre.

Vickery, L. 1993. Moving Window: an interview with Cathie Travers. In C. Meyer-Homji (ed.) *Soundscapes* **1**(2): 21–2. Melbourne: Soundscapes Pty Ltd. ISSN 1039–1312.

Vickery, L. (Guest Editor) 1996. Still Life with Chaos: an interview with Jonathan Mustard. In *Fremantle Arts Review* **10**(1) (June/July): 6–7. Fremantle: Fremantle Arts Centre Press. ISSN 0816–6919.

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