

## APPENDIX II: 'CARRIERS', ESSAY IN RADIOSONIC GLITCH

My album 'Carriers' was both an experiment with 'glitch' or microsound music, and the bounty from fifteen years of short-wave radio listening. The audio material was gathered with communications receivers, by tuning across the entire High Frequency spectrum (from 1.6 MHz to 30 MHz), seeking the odd and beautiful sonorities that haunt the ether: the chatter of data links, the whine of carrier waves, the chuckle and splash of static, the monochrome pipings of Morse, the background hash from stars, and the Babel of voices from broadcasting stations in a host of tongues. Western nations have largely abandoned communication via the High Frequency radio spectrum in favour of the Internet and satellite links; HF radio is still used by emerging nations, many of whom employ antiquated equipment and modes; by amateur operators making experimental transmissions; by defence, aviation, maritime and emergency services; by clandestine and espionage stations. This tumult of signals makes shortwave radio listening a kind of techno-archaeology; perhaps even electro-anthropology. For the composer of electronic works, today's radio spectrum offers a fat palette of shades, stark and subtle.

In late 2004, looking for fresh sources of material for my electroacoustic works, I recalled the sonorities of shortwave radio, and began once again to explore the high-frequency bands, and gather material. There were new rhythms and timbres, since last I had listened closely, during the early 1980s. Many of these timbres were created by new digital modes, with distinctive and compelling sonic signatures. I have referred to the gathering of radiosonorities as an 'archaeology' (perhaps anthropology) of the airwaves: the high frequency spectrum (1 MHz - 30 MHz) has been largely abandoned by developed nations as a reliable source of long-distance communication, in favour of satellite/Internet links.

This leaves those who choose, or are 'obliged' to use, shortwave, an interesting mix: Broadcasters servicing remote regions e.g. Radio Australia, China. Many RTTY services. News and Information programs from most nations: Voice of America, Radio Bulgaria; Military (strange and aurally engaging modes). Aircraft and maritime navigation beacons and weather services (odd and interesting modes); Yachting, astronomy, radiotelephone services to isolated ocean islands. And many others...

If we consider a carrier, that is, the electromagnetic energy generated and radiated by transmission equipment, as pure medium, and the modulation placed upon these emissions as message, then a question arises: Is there any message, if it cannot be decoded? or example, the carrier was modulated using single sideband, but our receiver has no Beat Frequency Oscillator circuitry? A digital mode was used to encode the data, but we have no software to decrypt it? We are listening to speech or text in a language we do not understand? I consider that such signals become sonic objects, and can thus be the subject of artistic manipulation.

The nine 'chapters' of the *Carriers* radiosonic essay are:

**gabble** ... (00.05) ... a test transmission on behalf of the composer.

**scatter** ... (02.28) ... an experiment in using pure 'glitch': static crashes, clicks, crackles, thuds, and unidentified moans.

**newfoundlandS** ... (02.21) ... on December 11,1901, Guglielmo Marconi, listening intently to a chaos of static at his station in Newfoundland, received the first international short-wave transmissions, sent by spark transmitter from Poldhu, in Cornwall. The message consisted of the repeated letter 'S'... Radio: a new found land.

**heterodialectic** ... (03.54) ... mixing two frequencies to produce a third

frequency is called 'heterodyning'. Mixing two old ideas to produce a fresh idea is called 'Hegelian dialectic.'

**BFO** ... (03.31) ... a beat frequency oscillator in the receiver provides the second heterodyning frequency, which is added ('tuned') until the signal becomes clear. When tuned to a pure carrier, containing no data, this beat-frequency produces a sine-tone that can be twiddled and 'played' like a musical instrument.

**NRV** ... (06.55) ... out in mysterious radio-space, lonely beacons tirelessly sing their simple song: in this case, the call-sign NRV. These transmissions are not intended for human ears: machine speaks to machine. What are they saying? They seem to waste their sweetness on the midnight air...

**stammer** ... (05.30) ... such beacons often speak in an urgent chatter, anxious, driving, relentless.

**babel** ... (14.17) ... across the spectrum, people are speaking a world of truth and drivel, of tragedy and trivia, urging upon their listeners the joyous and the jejune. Which is which? An essay about the intent and sceptical Australian ear. (*Babel* was selected by the Australian Music Centre as part of Australia's submission to the 2006 ISCM World New Music Festival in Stuttgart.)

**babble** ... ( 00.09) ... the chaos of communications: this track is the audio material of '*Babel*', sliced into nine-second segments, then stacked and played back simultaneously. Let nation speak unto nation, let a thousand schools of thought contend...

The tracks that comprise this essay were produced entirely by 'hand'; they were almost 'hand-written'. No sampler, sequencing software, or triggering keyboard was used to 'play' the prepared audio segments; the sounds were sliced up and rearranged in Pro

Tools, by means of a mouse. There was a little reverb added at some points, there was some pitch-shifting, but little equalization or other filtering. Software packages like *Sound Hack* and *Cloud Generator* were not used: I wanted the sounds to be as close as possible to the material I'd gathered. Short-wave radio provides quite enough filtering, and adds a considerable element of the aleatory to the audio.

The most 'musical' data modes are radio teletype, which uses FSK (frequency-shift keying) sending a rapid, two-note signal that warbles like a trilling woodwind, sometimes a tritone, or a perhaps minor-sixth apart. Some modes use up to 39 pitch-pairs simultaneously; the resulting 'howl' is another fascinating sonority. The intervals are 'pure': just intonation is the default tuning of machine-measured harmonics.

Other data transmissions are more percussive, especially when one switches across from single to double-sideband reception: in this case, the carrier itself is detected, with no 'pitch' added by the receiver's heterodyning circuits. The resultant chugging, chirping, creaking and tapping rhythms are reminiscent of techno dance-tracks, but their emphasis shifts as subtly as do the accents of a minimalist ostinato.

The use of a single frequency by multiple data transmission services can produce fascinating polyphonic and polyrhythmic complexity.

Short-wave radio is best heard at night, due to increased ionospheric density and consequent deflection (refraction) of electro-magnetic waves. Signals are 'bounced' around the earth's curve, sometimes right back to the transmitting site. Interesting dynamic effects result. 'Fading' is due to the variable nature of the earth's surface and atmosphere - humidity, vegetation, tall structures, large metallic structures (ships, bridges), all absorb or deflect electro-magnetic waves on their way from transmitter to

receiver. This produces a Messiaen-like serialism of volume levels in the signal that arrives.

Recontextualising radiosonorities within a musical narrative can load the original 'carriers' with an additional freight of meaning. This is the familiar trope of data sonification. It leads me to suggest, to composers of electroacoustic works, especially those working within the genre of *musique concrète*, that the shortwave radio spectrum as a sonic source, can be usefully rediscovered.

In 1997, Paul Théberge published his provocatively titled *Any Sound You Can Imagine* (see Bibliography), describing the current revolution in digital music-making and distribution. It seems to me, as an electroacoustic composer, that one's quest is always to seek any sound that one *cannot* imagine. And perhaps never could?

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