

## CATHERINE CHRISTER HENNIX AT INSTAL 10

C.C. Hennix has written an essay about her performance at INSTAL. We thought you'd like to read it.

Her work can on first impression sound incredibly simple. As non-specialists in the outer regions of advanced mathematics, Eastern philosophy and tuning systems, neurophysiology or the bathing habits of Heraclitus ("you cannot step into the same river twice"), we can't explain to you all the ways in which it is in fact composed of sophisticatedly interconnected parts; of all its complexity.

But it's safe to say that the following notes, as an example of the ways in which Hennix's music is informed, set her apart as one of our key thinkers of the drone, it's Eastern precedents and their interaction with specific trends in modern Western philosophical and scientific thought. The following notes are an important reminder of how the drone, (and it's uncanny nature as being both changing and yet still the same; of producing a sameness which is not identical), is far more than something that can be reduced to the merely sonic.

Arika, November 2010

CATHERINE CRISTER HENNIX

**SOLITON(E) STAR,  
RESONANCE REGION IA  
[ZERO-TIME SONIC MIRROR]**

FOR COMPUTER

TEXT VERSION.2

BERLIN, OCT. 15

DIGITAL INFINITARY COMPOSITION,

VERSION 1.0 (2003-2010)

DURATION: 189'17"

SPACE: INSTAL FESTIVAL, ARIKA, TRAMWAY 2010

The concept of an *infinitary composition* assigns *equal* significance to any point of its *continuum sound*. In particular, *no* significance is assigned to its beginning or end while any significance that is assigned to any of its parts must also be assigned to any other of its points in time -as defined by this continuum. The precept of the structure at issue is that of a *dense ordering* without first or last element (modeled by, for example, the rational numbers  $p/q$  between (but not including) zero and one - $p, q$  integers): This concept provides for compositions of pure *syntax* (of non-referential combinatorics rather than of a formal semantics), an alternative formulation of '*non-figurative musik*' explored once by Jan W. Morthenson and to whom we owe this suggestive label -*however*, with the following caveat, viz., Morthenson conceived of his non-figurative compositions as *strictly limited in time*, a precept based on the conception that the required concentration of a listener cannot exceed 10 minutes (or less) unless it would be seriously

compromised. In the present formulation there is no compromise neither of time nor of cognitive alertness.

Although uninterpreted (*not* 'figured'), pure syntax nevertheless tends towards self-organized configurations, at least when presented algebraically, carrying an apparently intrinsic but *wordless significance* - as a *self-organization of a pure sign event* recognized solely by its persistent regularities which alone lend it the coherency of a (hypothetical) nonsemantical event (as is the case with proofs in formal systems -or, at the other extreme, noise-induced memory in excitable media).

In more detail, a semiotical *borderline case* is posed by sounds perpetuated by persistent regularities but which remain *unfigurable*, sounding an unanalysable sonic enigma, exemplified in the traditional history of music by the (drone instrument) *tambura*. This borderline case, defined by sustained stationary sounds, is also as a modality of cognition most paradoxical in that the sounds of the latter instrument seem to *autonomously* generate a *casading semantics* that spell-binds the listener and make all musicians fall in line, and, hence, is *incomparable* to any other acoustic instruments. Yet, there is no record of a known grammar governing these disembodied sound wave maps which weave themselves tracelessly through time and space -like a semantical foam waiting to be deciphered. It is the crossroads defined by this borderline case which awaits its codification and future exploration by the particular approach that I have chosen for more than 35 years. Its recalcitrance to formal codifications only underscores the unavailability of a definitive theory and yet to be implemented data processing algorithms.

This modality of sonic incomparability and theoretical recalcitrance is also present in the integral sound of my most recent work;

SOLITON(E) STAR, RESONANCE REGION 1A  
[ZERO-TIME SONIC MIRROR],

the listening to which involves very much the same techniques as listening to LaMonte Young's Composite Sound Wave Form Environments -which originally inspired me to explore these magical regions of sound. However, the tuning differs from the latter and, in addition, has an added, if elusive, 'fluidity' as if the generating process is a condensation that never settles into a stationary state all while remaining close to it. This dimension of elusiveness may be characterized as a *Herakleitos Paradox in progression*:

the sound repeats, the sound is the same *and*  
- it is *not* the same!

In the present case, the spectacle is the play of an '*algorithmic instrument*' ('computer'), a freely vibrating *sound brane* that is driven by the work of an *algorithm*. (Here the close connection between the laws of physics (governing vibrational systems) and the abstract concept of an algorithm comes to the fore, viz., the fact that the running of any algorithm is limited by the Second Law of thermodynamics (as evidenced by the electricity invoice) and the fact that all laws of physics seem reducible to algorithmic properties (Turing's Thesis), facts which conjointly conspire to the *erasure* of any definitive border between 'inert' and 'thinking' 'matter' which, in turn, makes it possible to conceive of sound as precisely just that, as a species of 'thinking matter', or, at least, as a species being imbued by a subjectless 'subtle substance' (Newton). The distinction between what is 'objective' and 'subjective' becomes erased and falls away while perpetuating a cognitive state that must be considered enigmatic.)

The annihilation of profane experience is a well-known and unavoidable propedeutic for encountering and cultivating alternative states of consciousness and the routes to its portals. Alternate states of consciousness are tunable by sound and light and the mixture of the two

can prove to be a powerful instrument or tonic for entraining mind's hidden faculties. Bridges to these other dimensions of experience can be implemented by controlling all frequencies which must be *absent* from those which are present - those of which the Creating Subject needs to decouple from to achieve maximal resonance. It is a decoupling from the force which otherwise holds back the mind in its movements that provides for a frictionless passage between one of these induced worlds and another. Along this path there is no door to push -just the *instantaneous unloading* of excess mental configurations provides the sudden impetus by itself, both for the journey and the passage through the portal. Mind does not need conventional 'reality' as a means for this modality of transport. The process is familiar from the experience of falling into a *dream* and facilities such as *Dream Houses* (LaMonte Young-Marian Zazeela) are known to enhance the passage considerably.

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The duration of the computer animation *NÛR* is derived from the duration of the soundtrack, SOLITON(E) STAR, RESONANCE REGION IA [ZERO-TIME SONIC MIRROR]. The limitation of both durations reduces to a *space problem* (hardware meltdown, real estate scarcity) the solution to which never seems to allow for an *unlimited duration*, the preferred duration for both works. That is to say, observing certain time symmetries there are *no* restrictions, save the duration of the universe, on the length of the duration on either of these works. They are themselves *algorithmic implants* considered situated in *asymptopia* enjoying *adiabatic* time scales. Hence, no upper bound can be set in advance for the optimal durations for either of these computer generated works.

REMARK. Animation and soundtrack run on *independent* algorithms without any correlation obtaining between the two. Either may run without the other.

## APPENDIX

Our hearing sensors function not only as receivers/antennas (of/for sound waves incident on the ear-drum) but also as (non-linear) *amplifiers*. *Viz.*, in the interior of the cochlear lives a standing wave on which all vibrations incident on the ear-drum must travel the modulations of which determine the spectral 'profile' of the incoming sound. The hearing sensors function both as a lens and as the film on which the sound-image is continuously developed and printed each developed 'sound-print' being translocated over an array of 'Hopf-oscillators' in the course of which it activates the sensors corresponding to the spectral distribution (Fourier integral) initially determined by the elasticity of the ear-drum.

It is notable that this set-up is (like the physical vacuum) ordinarily *never disconnected or turned-off*, the hearing-sensors being tuned to continuously monitoring the sound-quality of the surrounding air. This 'ALWAYS-READY' -mode requires the sensors themselves to be in a *continuously vibrating mode* by which the interference-patterns printed over this mode determine (as in holography) the transmitted sound-image incident from any sound source of the immediate environment. In other words, rather than being a *passive* resonator (or array of resonators -as per the inadequate 'place theory') the hair bundle hearing sensors, like sea anemones, are continuously swinging back-and-forth on the back of a standing wave *actively probing* for any disturbances traveling down the cochlea's interior spiral and which deform the standing wave accordingly. This *collective, probing dynamics* is *strongly correlated* among its modular components and is maintained

by an  $\text{Ca}^{2+}/\text{K}^{+}$ -ion (low-voltage) DC-current (modulated by the motor-protein prestin), which apparently is responsible for both the onset and steady-state maintenance. (Knocked-out mice without prestin synthesis are deaf.)

It is not yet established if this information processing/ transmission network needs to take into account also the subtle effects delivered by the underlying quantum physics. But the following example may be relevant. Viz., anyone who has observed the flight of a bat at sunset must admire the navigational precision with which it comports itself aided solely by its hearing faculty. The speed with which a bat processes its sound-echoes is on the msec scale which means that there is practically no delay between the arrival of the sound-echo and its processing by the central nervous system as a fully interpreted signifying event (present space-coordinate location). Such computational speed is not feasible without recourse to a quantum regime and there are, consequently, compelling grounds for assuming that a bat's hearing faculty is aided by quantum physical processes although their nature remains obscure. However, as bats are mammals it would be surprising if they were the only mammalian species with quantum physiological mechanisms. In particular, there is no a priori reason why humans would be deprived of such mechanisms. In fact, given that the faculty of sight does require a quantum physical mechanism (which is already well-understood) it would be surprising if the hearing faculty is decoupled from quantum physical processes altogether. While no consensus exists as to which kind of 'matter' a vacuum instantiates it has been estimated that our neuronal information exchange systems admit an integral performance rate of about  $10^{18}$  operations per second with an internal master-clock running at 100GHz. If also the microtubular filaments of the cytoskeleton is assumed to participate in the integral information processing the performance rate increases by at least a 9-fold -to  $10^{27}$  operations per second! Clearly, no confined mechanical device, in the sense of classical physics, could simulate such a computationally intensive process since it would suffer

almost an instantaneous 'melt down' due to overheating. By contrast, 'vacuum physics', i.e. quantum physics, allows for avoiding mechanical glitches and permits long-range correlations essential for a smooth interaction with biological memory storages.

Despite its phenomenological fragility and theoretical inaccessibility perception of subtle sounds remains an accessible phenomenon that can be effectively explored by a careful choice of mindful tactics of attention, in particular by those tactics that are supported and enhanced by specifically tuned 'mathematical instruments', such as tamburas or sine wave generators. When successfully applied, each efficient such tactic when coupling to an appropriately prepared precision sound source amounts to mentally assuming a sustained NĀDA ĀSANA -an exercise bordering on 'Mind Yoga' establishing (under a regime that I elsewhere have called a 'sustained feeling of awareness' (and of which 'Divine Equilibrium' may be considered as a rare instance)) what might be called an auditory interior body-map.

According to the VEDAS, and in sharp contrast to the common Western concept of sound, sound is actually a quality of space rather than of time in the sense of conferring a presence of an 'atmosphere' or 'ambiance' to the progressive present thereby determining what is and will (soon) be present (and by which aspect). The universal cycles of time give the background against which these spaces emerge and vanish as they merge with local time-series either appearing as commanded cultural artifacts or else as spontaneous, unprogramed events. Raga-s and Vedic Chants are prime examples of the former, locally constructed artificial time-series of sound which, on the one hand, depend on where they intersect with the present cycle of time (circadian and seasonal rhythms), and on the other hand, determine which mode the corresponding spatial coordinates must carry and project. As a raga or chant unfolds it opens up an inner space which progressively effects the

perception of the *outer space*, one space aligning itself with the other along the intersection between sound and consciousness.

In the limit of this alignment space may become perceived, *without undergoing locomotion* (as in NĀDA YOGA ASĀNAS), as transforming itself from one 'state' to another at the moment sound is made to irradiate it. This transformation, although perceived as real by the subject, is entirely '*topological*' since there is no metric or geometry - there are no distances to cross neither in space nor in time! Remarkably, this mode of perception bears the signature of a unitary ground state transformation of an excitable medium processing topological quantum computations. Under this aspect, especially applicable to a musician in performance or practice, Vedic space becomes an *emergent phenomenon* by which each sound defines a unique state of space perceived in terms of a certain 'quality' or 'ambiance' specific to it as *mediated by a unitary ground state change originating in the minds of those present*. It is, of course, a challenge to set up this correlation or mapping and at present nobody knows even where to begin. Following the suggestion of Baskaran the most promising area in which to look for clues is soft condensed matter physics and, I would add, topological matter physics.

The physics of confined 'biological matter' exhibits already many analogies with condensed 'cold matter' especially with respect to its ability to assume exotic or anomalous phase-transitions (Bose-Einstein condensation; marginal compactness; Casimir forces). Eventually, it is to be expected that so called 'alternate states of mind' will have a correlation with the subject's capacity for entering into alternate ground states, which, possibly, are merely topological phases of biological matter. In its abstraction from time the Vedic concept of sound provides a reminder that already on a basic intuitive level sound has the capacity to transform the perception of space if only the subject allows for the corresponding change of the inner ground state. Following this lead new areas of sound can emerge which, if not facilitating this correspondence, at least can enhance its prominence.

It has been known for some time that perception and feature integration processes have been associated with the  $\gamma$ -range (30+ Hz) synchronous oscillations (the thalamic pacemaker frequency) which serve to tune neural assemblies as a means to facilitate the temporal segregation during  $\beta$ -range synchronized oscillations (while synchrony in the  $\beta$ -range (11-30 Hz) has been associated with an attentional state that may facilitate the occurrence of  $\gamma$ -range synchronization). (As an historical curiosity, it might be mentioned that Norbert Wiener, in his first attempts to model human consciousness mathematically, assigned central importance to synchronous  $\alpha$ -range oscillations (8-13 Hz) as the 'master-clock' against which all other states of consciousness unfold in time. Besides being a wild guess, it later turned out that the  $\alpha$ -range only entrains states of idle arousal!).

If the physics of 100 years ago taught that there is no space and no time (as per General Relativity) and, hence there can be no (unique) physical 'reality', neurophysics teaches today that not even the subjective reality is endowed with uniqueness as our minds are running (on? -Lacan) a controlled hallucination that is continuously matching data coming from our senses, processing only those items which maintain the preferred state of hallucination. This state of the excitable system is considered based on the *autonomous oscillations* of the thalamus which are maintained even when thalamus is disconnected from the cortex. On the other hand, cortex may be viewed as the highly connected network it is but *periodically modified* by stimuli from the thalamus pacemaker *even in the absence of sensory data*. Remarkably, Lacan maintained a very similar thesis more than 50 years ago, based, however, on an entirely distinct epistemological paradigm originating with Freud. In any case, the findings so far emphasize the importance of the *resonance of incoming stimuli with spontaneous brain activity* as an essential prerequisite for perception. In particular, the dynamics of the

cognitive '*binding*' (or 'bundling') of data features depends critically on the entrainment of  $\gamma$ -oscillations the disruption of which causes bundles of data features to 'unbind' or 'dissociate' -as happens under anesthesia or intervals of sleep. The frequency distribution profile for SOLITON(E) STAR, RESONANCE REGION(E) [ZERO-TIME SONIC MIRROR] supports frequency amplitudes throughout the  $\gamma$ -band, the latter providing for large-scale synchronization during the continuum sound perceptual events by which spatially distant neuronal subpopulations may be synchronized with a common structure that oscillates.

(I have conjectured that the ultimate time-scale of integrated cognitions by synchronized by the *protein folding dynamics* which provide for the most fine-grained quantization (down to *picosecond* time-scales) of biological signal transduction time-series (to be contrasted with Wiener's erroneous 'guess', cited above). In particular, if the folding process can be orchestrated deterministically by *solitons*, the entrainment of soliton mediated protein foldings would be controllable by coherent wave forms possibly enhanced by my present *solitone(e)s* and the corresponding states of consciousness may turn out to be extraordinarily exotic. Recently, several authors have suggested an important role played by analogues of '*Bose-Einstein Condensation*' in excitable media. In view of the fact that solitons not only appear in vivo in excitable media but that they also may induce and maintain a condensate has made me think that this type of (massless) structure is perhaps 'universal' for alternate states of consciousness. In fact, coherent waveforms appear at every time scale at which transduction takes place and they interlock seamlessly giving the impression of a 'unified' percept (the binding-effect). For example, during acts of perception of a sound continuum at low noise levels, owing to the resonance between the intrinsic neuronal oscillations and the periodic signal (for example, from a soliton(e)-source), firings of neurons become *phase locked* to the input signal, leading to *synchronized firing*.

It is known that when stimulated by a constant signal of *low* frequency, neurons take less times of spatiotemporal summation to fire due to the long duration of the persistent signal that is stationary around its maximum (which mitigates the circumstance that longer wavelengths take longer time to process than shortwave signals). The *phase locking makes neurons fire nearly every period of the signal*, which, in turn, reinforces the synchronicity of the firing. And although pure noise can generate some figuration or other, even if unstable, by contrast, signals that entrain collective excitations of synchronous resonances which transduce all the way, from the most coarse-grained to the most fine-grained levels of signal processing the excitable system conducts, entrained collective excitations are, *syntactically*, the only configurations that memory can reproduce and thus, potentially, function as a depository for signification. Depending on the perceiving subject, these depositories may be empty or not, and, if the latter is the case, they can serve as 'seeds' of a subjective ('private') but ineffable semantics.)