Traité des objets musicaux revisited

CARLOS PALOMBINI
Visiting Lecturer
Departamento de Música
Universidade Federal de Pernambuco
CAC
Av. Acadêmico Hélio Ramos s/n
Cidade Universitária
Recife PE 50740–530
Brasil
Palombini@altavista.net

Abstract

While Pierre Schaeffer's taste for paradox puzzles readers, one of the greatest paradoxes of *Traité des objets musicaux* is that it remains one of the most cited and least read books of the electroacoustic literature. Clearly, no one has thought out the aesthetic implications of the analogue sound medium with Schaeffer's insight and depth. And yet computer music, because it has not always paid enough attention to this reflection, sometimes finds itself conceiving of the digital domain with the conceptual apparatus of handwork technology. The synopsis and contextualization that follow pay tribute to the fiftieth anniversary of *musique concrète*.

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Between 1945 and 1953, writes Mitcham (1994), technology took the world stage in defiance of the human mind that fostered it up: A-bomb (1945), ENIAC (1946), kidney transplant (1950), H-bomb (1951), UNIVAC (1951), DNA (1953). Between 1954 and 1962

the new powers were put to use within traditional frameworks, with increasingly conflictive results: USS *Nautilus* (1954), birth control pill (1955), MASER (1955), *Sputnik I* (1957), integrated circuit (1959), LASER (1960), *Vostok* (1961), *Mariner 2* (1962). The period comprised between 1963 and 1972 was one of the most creative in the history of science and technology policies. Human, political, and economic frameworks were adapted or altered. Initiatives in assessment and control were taken: limited nuclear test ban treaty (1964), Harvard University Programme on Technology and Society (1964), *Humanae vitae* (1968), Greenpeace (1969), Earth Day (1970), Stockholm Conference (1972), *The Limits to Growth* (1972).

In 1951 the French Radio presented the Groupe de Recherches de Musique Concrète, which at the time consisted of Pierre Schaeffer,[1] the engineer Jacques Poullin, and the composer-percussionist Pierre Henry, with the first purpose-built electroacoustic music studio ever. The collaboration between Schaeffer and Poullin, in its fourth year, was resulting in a three-track tape recorder, a machine with ten playback heads to replay tape loops in echo (the Morphophone), a keyboard controlled machine to replay tape loops at twenty-four pre-set speeds (the keyboard, chromatic, or Tolana Phonogène), a slide-controlled machine to replay tape loops at a continuously variable range of speeds (the slide, continuous, or Sareg Phonogène), and a device to distribute live an encoded track across four loudspeakers, including one hanging from the centre of the ceiling (the potentiomètre d'espace). Output from 1951 to 1953 comprised *Étude I* (1951) and *Étude II* (1951) by Boulez, *Timbres-durées* (1952) by Messiaen, *Étude aux mille collants* (1952) by Stockhausen, *Le microphone bien tempéré* (1952) and *La voile d'Orphée* (1953) by Henry, *Étude I* (1953) by Philippot, *Étude* (1953) by Barraqué, the mixed pieces *Toute la lyre* (1951) and *Orphée 53* (1953) by Schaeffer/Henry, and the film music *Masquerage* (1952) by Schaeffer and *Astrologie* (1953) by Henry. In 1954 Varèse and Honegger visited to work on the tape parts of *Déserts* and *La rivière endormie*.

In 1953 the Groupe de Recherches de Musique Concrète of the Radiodiffusion-Télévision Française rallied elektronische Musik, music for tape, and 'exotic music' under the banner of experimental music to compare methods and establish complementary research programmes (see Palombini 1993). Written in 1953 and published in 1957, 'Vers une musique expérimentale' minimized frictions. Considering that tonal relations were inherent to the construction and technique of Western instruments, Schaeffer in principle objected to serial methods as applied to traditional instruments, but he observed that, in practice, the *listening* to such pieces could be validated by a certain technique of hearing. Considering that when applied to sound qualities other than pitch the series would lose its negative character and open to new sounds the domains of tradition, Schaeffer in principle

accepted the application of serial methods to complex sounds, but he observed that, in practice, such sounds had little to gain from systematic recourse to serial techniques. The methodological syncretion failed to materialize. In Paris and in Cologne, manipulated samples and electronically-produced sounds amalgamated into Henry's *Haut voltage* and Stockhausen's *Gesang der Jünglinge* in 1956. In 1957 Schaeffer outlined the method of research after musique concrète. *Étude aux allures* (1958), *Étude aux sons animés* (1958), and *Étude aux objets* (1959) illustrated that method. In 1958 the Groupe de Recherches de Musique Concrète was transformed into Groupe de Recherches Musicales. In 1959 Tolana advertised the Phonogène Universel, which dissociated downward and upward shifts in tessitura (spectral transposition) from distension and contraction of dynamic shapes (temporal transposition).

In 1954 Heidegger stated that humans were delivered over to technology in the worst possible way when they regarded it as something neutral; for this conception of it, to which they particularly liked to do homage, made them utterly blind to the essence of technology.[2] Because the essence of technology was nothing technological, essential reflection upon technology and decisive confrontation with it ought to happen in a realm that were, on the one hand, akin to the essence of technology and, on the other, fundamentally different from it. Such a realm was art. But only if the arts were not conceived as deriving from the artistic, if art works were not enjoyed aesthetically, if art were not a sector of cultural activity. Art demanded to be reconducted to the golden age of Greek techne. In 1958 Simondon saw culture as unbalanced because it enshrined the aesthetic object in the world of significations while driving the technical object back into the structureless world Lef what had no signification but a use. Simondon sought to integrate the machine into the family of human things as a component of a global rebirth of culture. The gap which separated the occidental man from the work of his hands demanded to be bridged. And the activities of the craftsman, simultaneously ancient and modern, provided a model of understanding, employment, and humanization of the machine (Hart 1989).

Pierre Schaeffer delivered *Traité des objets musicaux, essai interdisciplines* in 1966 after fifteen years of labour. The work was dedicated to the memory of his father, whose precept — 'practise your instrument' — the author passed on. *Traité* follows a zigzag course in seven jumps named books. 'Book One' links the genesis of music to the birth of the musical instrument, defined as the causal permanence that engenders organizations of sound *character* (and hence timbre), out of which variations of musical *values* (paradigmatically pitch) appear. 'Book Two' postulates four functions of listening. Ouïr (to hear) is to posit iconic (i.e. similarity based) relations between representamen and object (or signifier and signified): on the verge of semiosis, creaks lay dormant in the background

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[1] 'Engineer by necessity, writer by vocation, composer by chance'... 'Neither researcher, nor composer, nor writer'... 'Writer by inclination, musician by heredity, polytechnician by constraint, innovator by complexion'... 'Author of literary texts marked with the concern of style'...

[2] Machover (1984) introduces *Musical Thought at IRCAM* ascribing the diversity of musical outlook there 'also to the neutrality of technology, which offers powerful tools for exploration and creation but does not orient the composer in any particular musical direction.'

noise. *Écouter* (to listen) is to posit indexical (i.e. causal) relations between representamen and object: creaks stand for ungreased hinges. *Comprendre* (to comprehend) is to establish symbolic (i.e. consensual) relations between representamen and object: creaks stand for tempered pitches agreeable to a metrics of successive divisional operations. And because hearing, listening, understanding, and comprehending are lexicalized acceptations of *entendre* — by semantic derivation from the etymological sense, 'to turn one's attention' — the French language allows Schaeffer to construe *entendre* as to hear, listen, understand, and comprehend in mindfulness of one's intention.[3] Thus sounds open themselves up to iconism, indexicality, and symbolism with intent. Reduced listening follows thence as a bracketing of symbolic and indexical relationships such as references to the traditional solfège and to source or causality might afford, whereby the *sonic object* unveils itself as an aggregate of shape and matter qualities. As *ouïr* ebbs *entendre* flows, as *entendre* ebbs *ouïr* flows, and as such movements alternate, sonic things disclose themselves as sonic objects whose intrinsic qualities bespeak details of the sound-producing event and novel abstractive possibilities.[4] 'Book Three' shows the distinct natures of, on the one side, the physical measurements of frequency, time, amplitude, and spectrum, and, on the other, the subjective perceptions of pitch, duration, intensity, and timbre, thus highlighting the perceptual frailty of the soundest parametric construction. 'Book Four' appropriates Husserl, Gestalt, Jakobson, Lévi-Strauss, Merleau-Ponty, Peirce, and Saussure in the interest of musical research. 'Book Five' sets forward criteria to single out sound units from sound continua (identificatory typology) and to select sonic objects where musicalness dwells in posse (classificatory typology). 'Book Six' expounds the method of musical research and outlines seven *criteria* of the morphology of the potentially musical object that are likely to emerge as musical *values* in the context of structurations: mass, dynamics, harmonic timbre, melodic profile, mass profile, grain, and pace. Enlarged for the 1977 reprint, 'Book Seven' comes to the conclusion that no *universal polymorphous musicalness* has arisen from the systematic analysis of sonic objects.

The Solfège of the Sonic Object purports to take, from the practice of sound-producing bodies, to a universal musicalness through a technique of hearing. It comprises a preliminary stage, four operations, and an epilogue. In the preliminary stage, heterogeneous sound-producing bodies are put into vibration by various processes and the resulting sounds are recorded. In the first operation — Typology — sonic objects are singled out from sound continua and selected or discarded according to a musicianly penchant.[5] In the second operation — Morphology — the objects selected are compared, perceptual criteria that make them up are named, and the objects are classed as tokens of such criteria.[6] In the third operation — Characterology — interactions of criteria within a given object are identified and referred to a sound-producing event.[7] In the fourth operation — Analysis — objects evincing a particular criterion are set against the perceptual fields of pitch, duration, and intensity so as to establish cardinal (absolute) or ordinal (relative) scales of criteria. In the epilogue — or Synthesis — new musics are expected to arise, based on reference structures that should play, for each of the seven morphological criteria, a role similar to that played by interval relations and the games of tonality and modality.[8]

The nexus of Schaeffer's research becomes transparent when some avatars of the question concerning the instrument speak their names: 'relay-arts' (1941, 1946), or analogue techniques of sound and image reproduction as instruments of new art-forms; 'noise piano' (1950), or organizing heterogeneous sound-producing bodies into new musical instruments; 'turntable piano' (1950), or analogue techniques of sound reproduction as applied to the conception of a most generic musical instrument; 'cut bell' and 'looping groove' (1950), or analogue sound manipulations as instrumental in the disclosure of the sonic reality; 'pseudo-instrument' (1952), or organizing sonic objects into virtual musical instruments; 'piano law' (1960), or the inverse relation between spectral richness of resonance and incisiveness of attack across the piano tessitura (i.e. the lower the tone, the richer the spectrum and the less incisive the attack, the higher the tone, the poorer the spectrum and the more incisive the attack); 'characterology' (1966), or the systematic investigation of such laws as a means to retrieve the sound-producing event in sonic shapes; 'translation into sound' and 'translation from sound' (1966), or the traditional composer's and the sound recordist's divergent technologies of listening; 'acousmatic listening' (1966), or sound recording as an instrument of poiesis.

In 1936 Benjamin expounded the decline of that unique appearance of a remote reality, however near (the 'aura' of artworks and nature), as a result of the proliferation of mechanical reproduction. In 1954 Heidegger evoked the flow of distanceless uniformity

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[3] Schaeffer exhumes the oppositions *ouïr/écouter,* where *ouïr* signifies the physiological phenomenon, *écouter* the psychological act; *entendre/écouter,* where *entendre* signifies the physiological phenomenon, *écouter* the psychological act; and *ouïr/entendre,* where *ouïr* signifies the physiological phenomenon, *entendre* the psychological act (cf. Littré 1877 and Barthes 1977).

[4] Schafer (1977) notes that, unlike Schaeffer's sonic object, the *soundscape* cannot dispense with causality and meaning.

[5] Typology establishes that the level of complexity of a sonic object is contingent upon the listener's dissective or integrative intention. Schafer (1977) picks out Schaeffer's term for the smallest autonomous component of a soundscape (but see note 4 above). Cadoz (1984) 'broadens' the concept, applying the term to complex sounds: 'in Schaeffer's book, the notion of an object is associated with elementary sounds.'

[6] Smalley (1986) slices typo-morphology into pieces, splices them into 'spectro-morphology' — 'a preferable term' — and pronounces spectro-morphological thinking 'the rightful heir of Western musical tradition'.

[7] Risset's 1966 discovery — by digital analysis and synthesis — that the brassy character of trumpet tones ensues from a linkage between amplitude increase and upper partials boost fits into the Characterology project.

[8] Lerdhal (1987) purports to lay the foundations of 'an authentic syntax of timbre', likewise modelled on tonality.

where all things were carried away and mixed up; by plane, the radio, the film, television, and the atomic bomb. The bomb and its explosion were the mere final emission of what had long since taken place: the estrangement of Western thought from the thingness of the thing. In the same year, Heidegger depicted the sinking of the object into the objectlessness of the standing reserve under the rule of Ge-stell, the essence of modern technology, according to which everything, including man himself, had become material for a process of self-assertive imposition of human will on things, regardless of their own essential natures (Hofstadter 1971).

Schaeffer's relay-arts instrument pertains to the history of mechanical reproduction, and there is a close resemblance between the two manifestations of *technische Reproduzierbarkeit* as expounded by Benjamin— 'artwork reproduction and the art of film' — and the double role of the relay-arts instrument as expounded by Schaeffer: 'to retransmit in a certain manner what we used to see or hear directly and to express in a certain manner what we used not to see or hear' (see Palombini 1997). In the history of mechanical reproduction, the relay-arts instrument materializes the shift from 'older handwork technology' to that technology which, in the words of Heidegger (1954), 'unlocks, transforms, stores up, distributes, and switches about' the energies of nature, and whose essence Heidegger terms Ge-stell. The 'decline of the aura' — a feat of mechanical reproduction —is intersected by 'the sinking of the object into the objectlessness of the standing reserve'— a feat of Ge-stell — but while the former paves the way for art as political praxis, the latter elicits from Heidegger an invitation to a return to the golden age of presocratic techne. Is this not praxis?

Pythagoras professed cyclic recurrence of events, metempsychosis, and kinship of humans with all living things. Yet he 'carried out scientific investigation more than anyone else' (Heraclitus) and 'was not the lesser of Greek sages' (Herodotus). Upon Pythagoras' death, his followers split into Acousmatics (practitioners of the mystic doctrine) and Mathematics (remarkable scientists). For Schaeffer, music had not sprung from the numeric proportions of intervals. Larousse presented the Acousmatics as disciples of Pythagoras who, for five years, listened to the master speak from behind a veil, observing the strictest silence. Schaeffer metaphorized the analogue medium into that veil, to unveil a hearing to which we have grown accustomed: listening — on the telephone, tape, the radio — to sounds whose original source remains unseen.

The musical note, a glaring assortment of pitch, duration, and intensity, has borne sway over European tradition and laid claim to universality. Owing to a notational system, the composer sings in silence, plays in silence, sight-reads in silence. The score prefigures the work, which is one and the same with the symbols of writing: 'Beethoven's quartets lie in the storerooms of the publishing house like potatoes in a cellar' (Heidegger 1935). The composer does not hear but reads, 'pre-listens'. Schaeffer likens his demarche to the scholastic exercise of translating a text from one's mother tongue into a foreign language. The performer translates symbols and notions *into sound,* and an implicit, readable work, becomes explicit, audible to laymen. Still, there is something sonorous in a musical composition. 'The thingly element is so irremovably present in the art work that we are compelled rather to say conversely that the musical composition is in sound' (ibid.). The sound recordist does not read but listens. Comparing the sound image generated by the electroacoustic chain with the original sound phenomenon, which originates from real instruments and unfolds in real magnitude over the acoustic field, he translates *from sound.* Schaeffer likens this demarche to the scholastic exercise of translating a text from a foreign language into one's mother tongue.

In the first century Plutarch expostulated with youth about the exertion of speech to the detriment of listening: to listen extempore is ill-advised! 'He who plays the ball simultaneously learns to throw it and to catch it, but when it comes to speech, on the contrary, reception takes precedence of deliverance, just as conception and pregnancy precede birth.' In 1931 Spengler showed vision as the nordic predator's sense par excellence, hearing as the prey's. In 1953 Barthes traversed the geometry of the writer's space: horizontally, the *language,* a consensual corpus common to all writers of a period; vertically, *style,* a repertoire of gestures — imagery, delivery, vocabulary — springing from the writer's past; obliquely, *écriture,* an act of historical solidarity binding the writer's utterance to the vast History of the Others. Schaeffer set sail from Literature in avoidance of the commitment of *écriture* for which writing pleaded. Bound for music, his commitment was all too clear: to reconcile technology to nature. Substituting perception for expression as the locus of such a commitment, he raised *écriture* to the second power; substituting hearing for seeing, he cubed it. Notwithstanding, three fallacies — 'Schaeffer is a composer', '*écriture* is writing', and 'written note and written word are the selfsame sign' — have compacted into a petitio principii: 'Schaeffer is the antithet to the *écriture* composer'.

When a boy communicates he collects his thoughts; he makes silence. He awaits something from Himself or his Visitor. He waits upon some Thing to increase the feeling of His presence to It and of Its presence to Him. 'Bereft of words, prior to any intention, adoration is attention, a summons to consciousness' (Schaeffer 1969). Listening reducedly, we receive a sonic thing whose image starts forming in our consciousness. The flow of distanceless uniformity where all things are carried away and mixed up is halted thereby. 'That the thingness of the thing is particularly difficult to express and only seldom expressible is infallibly documented by the history of its interpretation' (Heidegger 1935): a bearer of traits (i.e. the sonic object as qualified by the seven morphological criteria); the unity of a manifold of sensations (i.e. the transcendental sonic object); formed matter (i.e. the shape/matter pair that underpins morphology). That remoteness, however near, is the sonic thing itself. From the objectlessness of the standing reserve Schaeffer elicits a sonic object that relapses into there as musicalness reservoir. There is in the sonic object 'the impetus of a break and the impetus of a coming to power, there is the very shape of every revolutionary situation, the fundamental ambiguity of which is that Revolution must of necessity borrow, from what it wants to destroy, the very image of what it wants to possess' (Barthes 1953). For all that, the sonic object is not an aesthetic product but a signifying

practice, not a structure but a structuration, not an object but a work and a game, not a group of closed signs but a volume of traces in displacement, not signification but the signifier, not the old musical work but the Text of Life (cf. Barthes 1974).[9]

In the fourth century B.C. Lieh-tzu asseverated: 'The perfect discourse is wordless, the perfect act is not to act.' In 1857 Baudelaire limned the Orient of the Occident, the China of Europe, an Occidental China, where Nature was recast by dream. In 1881 Nietzsche argued: 'You say that food-place-air-society determine and transform you? All the more so do your opinions, for they determine you as to your choice of food-place-air-society.' In 1925 Artaud avowed: 'I suffer from the translation Mind, the Mind that intimidates things so as to make them enter into the Mind.' In 1974 Barthes uphold: 'We must above all aim at *fissuring* the meaning system itself: we must emerge from the Occidental enclosure'. In 1995 Handelman averred: 'To alter our way of perceiving is to alter who we are, to alter the structure of knowledge and the process of knowing itself. Similarly, alterations in knowledge and the process of knowing are impossible without corresponding changes in perception.'

With reduced listening, Schaeffer has brought hearkening to sonic things up to date with the poetics of Varèse, Scelsi, Ponge, Freud, Heidegger, Barthes, Lacan, and Calvino. With the sonic object, he has brought listening to recorded sounds into the world of significations. With acousmatic listening, he has brought the tape machine into play as a component of a global rebirth of culture. With musique concrète, he has brought the technical object's *concretude* (see Simondon 1958) to bear upon the 'problematics' of Western composition. Schaeffer died on 19 August 1995: 'My essential role is to communicate a manner of comprehending, feeling, and acting that may seem, from the outside, terribly personal. In fact, I am but a relay myself.'

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[9] In 1975 Stefani opened the proceedings of the First International Congress on Musical Semiotics avouching that the object of musical semiotics was the score, since no theory of the musical Text existed yet, and Schaeffer's sonic object would not be reckoned with.

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Música Fractal: As novas tecnologias da musica contemporânea

Frederico Richter (Frerídio)*
Universidade Federal de Santa Maria
Prédio 40 (CAL), 1° Andar, s. 1211
Campus da UFSM, Faixa de Camobi, Km 09 -
97119-900 – Santa Maria - RS - Brasil

Resumo

Este artigo trata da aplicação de sons fractais na composição musical e a compatibização de estruturas novas com as já existentes. Apresenta, ainda, uma análise de obras fractais e os caminhos seguidos por elas.

1 - Os Fractais: uma análise estética e histórico-científica

Música e cálculo sempre andaram juntos desde a antigüidade. A teoria musical, a composição e a construção de instrumentos derivam de leis da física e da matemática, segundo David Ernst(1977). Béla Bartok usou a Seção Áurea para a *gestalt* de suas obras (*gestalt* entendida como forma e conteúdo interno- sugerimos que seja usada a palavra **contextura**, em lingua portuguesa). A tendência de usar a ciência para estruturar criações, sejam de música ou das artes em geral, sempre existiu. Benjamin Boretz e Edward T. Cone (1971) escreveram que não se pode ignorar os compositores que pesquisaram e ainda pesquisam nos Estados Unidos, tais como Milton Babbit, J.K. Randal e Arthur Berger. Todos estudaram exaustivamente os sistemas de 12 sons e especialmente as obras de Schöenberg onde a aplicação numeral é marcante e foi estendida por estes compositores para cálculos mais complexos. Os mesmos autores dizem que, durante os últimos 50 anos, houve várias tentativas, na teoria musical, cientificamente orientadas mostrando o caminho do futuro ao compositor e ajudando-o a encontrar uma base firme no período de caos que seguiu à desintegração da escala maior e menor (sistema tonal) no começo deste século. Esses autores falam da existência de um movimento para Quarteto de Cordas de Joseph Haydn, composto em seu comprimento (duração) conforme as proporções da Seção Áurea.

Neste século, novos meios emergiram e novas estéticas advindas da Ciência (física), Tecnologia (computador e informática) e da Matemática (proporções e domínio racional) surgiram. Entre elas, as teorias da <u>não linearidade</u>: em conseqüência, a <u>física não linear</u> em contraposição à física tradicional, a <u>Geometria Fractal</u> em contraposição à Geometria Euclidiana e a <u>Tecnologia de Ponta</u> em contraposição à Tecnologia Mecanicista. Disto tudo, o mais importante foi o desenvolvimento do computador.

Este acelerando científico influenciou todas as manifestações culturais do homem. E a Música Fractal também necessita para seus cálculos recursivos de velocidade, portanto do computador (gráfico). Há dois aspetos a considerar a respeito dos fractais: