DE DIVERSIS ARTIBUS
COLLECTION DE TRAVAUX DE L'ACADÉMIE INTERNATIONALE D'HISTOIRE DES SCIENCES
COLLECTION OF STUDIES FROM THE INTERNATIONAL ACADEMY OF THE HISTORY OF SCIENCE

PROCEEDINGS OF THE XX[th] INTERNATIONAL CONGRESS OF HISTORY OF SCIENCE (Liège, 20-26 July 1997)

VOLUME XX

SCIENCE, PHILOSOPHY AND MUSIC

Edited by

Erwin NEUENSCHWANDER and Laurence BOUQUIAUX

BREPOLS

" JEU DE MIROIR *SUS UNE FONTAYNE* "

Roberto DOATI

DE MUSA ET MUSICA

When I received the invitation to realize a new piece with electronics at the *Centre de Recherches et Formation Musicales de Wallonie*, it has been natural for me, living in Padova, to think to Johannes Ciconia (1340-1411). Not only because the great composer and theorist from Liège lived his lest years in Padova, but also for the deep interaction between science and music in his life and work. He shared the same feelings with Prosdocimus de Beldemandis, mathematician, astronomer, doctor and writer of musical treatises — a truly representative of the medieval *quadrivium* conception — who was working in Padova in the first decade of 15th century.

In his treatise *De Proportionibus*[1] Ciconia writes : *Ille proprie musicus est qui musicam habet speculativam.* This medieval Latin can be translated " The true composer is who makes a music which arises from [*or* which produces] a reflection ". Reflection to be intended not only as thought, speculation, but also as formal reflecting. As a master of fact Ciconia is initiator of a big tradition which through musical structure based on canons will give rise to some of the greatest intellectual works in Western culture[2]. Important figures of this tradition are composers from French and Flemish countries such as Binchois (Mons, *ca.* 1400), Dufay (?, *ca.* 1400), Ockeghem (Dendermonde ?, *ca.* 1428), Desprez (Beaurevoir, *ca.* 1440), Obrecht (Bergen-op-Zoom, *ca.* 1450).

My choice to work on the *virelai*[3] *Sus une fontayne* is already a first reflection game. To show my veneration for the *Maestro* from Liège I choose this work because through several quotations Ciconia himself renders homage to a great musician and theorist he admired : Philipoctus de Caserta. But most important of all this *virelai* is an impressive example of what is defined *ars subtilior,* an art of proportions from big complexity.

1. J. Ciconia, " Nova musica. Liber tertius ", *Thesaurus Musicarum Latinarum*, vol. 9. *Greek and Latin Music Theory*, 1993.
2. Think to the influence this important tradition had on composers such as Bach and Webern.
3. Poetic and musical form of the troubadour in *oïl* language.

The term *subtilitas* appears in fourteenth century musical treatises to indicate a sort of rhythmic distortion of the melodic line. The purpose is to augment the independence of this line in front of the harmonic texture[4]. The so distorted melody — usually the *cantus* — fits into a polyphonic context where each part *(cantus, tenor, contratenor)* follows its own " grammar " which is more or less peculiar and individual. The *tenor,* straight and formal, the *contratenor,* virtuosistic and fragmentary counter-part, sometimes canonical or mathematical, and the *cantus,* " distorted " and winding. The achievement is a complex — but still comprehensible — play between three totally autonomous parts, which give rise to a diffuse rarefied atmosphere. The *subtilitas* begins in France — particularly at the Avignon court — and soon reaches the pro-French courts in Italy (Pavia, Milano, Modena).

In Italy the *subtilitas* becomes *subtilior*[5] — term used for the first time by Prosdocimus. The complexity of the weaving counterpoint is increased and the *subtilitas* undergoes a dramatization. The transgression is subjected to the Italian peculiar need to represent.

Acoustic treatments

Chance, intuition and my Italian culture made me dramatize the single parts of the *virelai,* shaping them on the temperament of the musicians I have worked with. I am always interested in writing music which in some way reflects the psychological and interpretative character of the musicians I am working with. In this case the " grammar " used for each part recalls both the voices character of the *ars subtilior* and personality of Izumi Okubo *(cantus,* violin), Catherine Binard *(contratenor,* flutes), Jean-Pierre Peuvion *(tenor,* clarinets). The instrumental score is a " corrupted " transcription of the *virelai* three voices for violin, flute and clarinet. Each note from Ciconia's work is " transformed " on the score following 5 treatments classes (fig. 1).

Figure 1.

Class	Group	Examples
A	Time transformation	flutter-tonguing, *jeté*, trills, *acciaccature*
B	Pitch transformation	mikrotones, *glissandi*, transpositions
C	Dynamics transformation	flutter-tonguing, *tremolo* & its variations
D1	Timbral harmonic transformation	timbral trills, harmonics
D2	Timbral inharmonic transformation	multiphonics, *pizzicato*, keystrokes
E	Interpolation	transitions between different manners

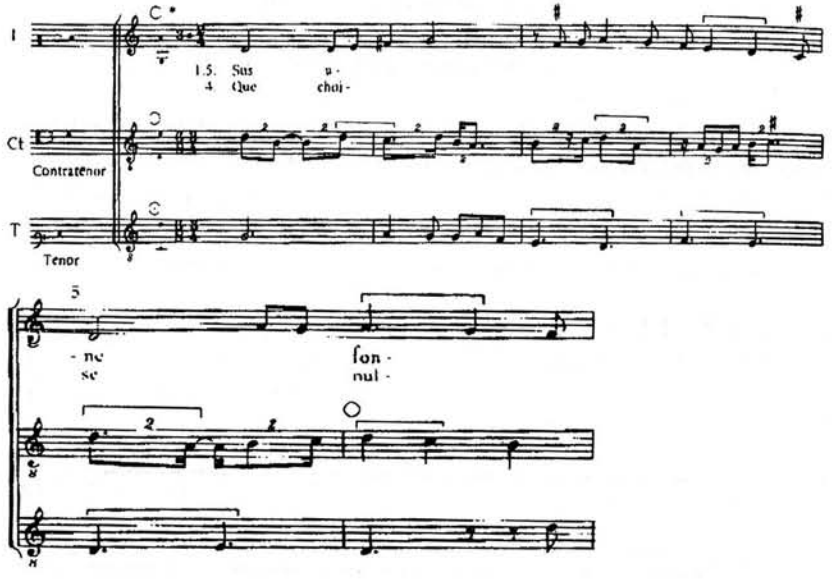
Classes of acoustic treatments for *Felix Regula.*

4. Anonymous treatise, *Tractatus figurarum*, 1989.
5. U. Günther, " Das Ende der Ars Nova ", *Die Musik-Forschung*, 16 (1963), 105-120.

In figure 2 we can compare the modem notation[6] of *virelai* first measures (a) and its treatments (b) through the application of classes in fig. 1. The association between notes and classes is based on a musicological and sometimes visionary analysis of *Sus une fontayne*. Comparing a performance of the original *virelai*[7] the metronome has been slowed clown about 5 times (crotchet = 35). For formal reasons, besides the rhythmic and timbral articulation, I modified — only twice — the original interplay of the parts. In the example of figure 2, I doubled the durations on the *cantus* measures, and in another place I subtracted 6 measures to the *contratenor* part. The fact that these changes do not alter anyway the " architecture " of the work is a demonstration that in fourteenth century compositions were often conceived as a sort of assembly kit. This is one of the reasons why so many contemporary composers fell attracted by Middle Ages music.

Each instrumental part has been recorded in studio — musical assistant Jean-Marc Sullon — apart from the other to maintain the same character of detachment of the *virelai.*

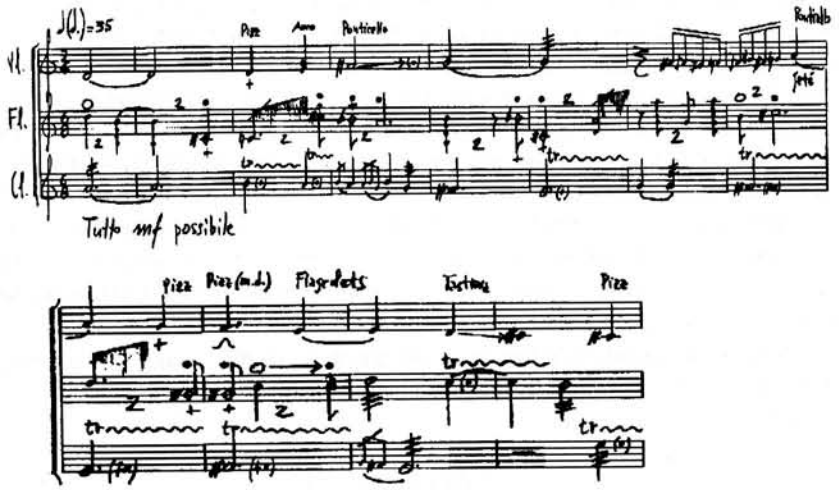
Figure 2a.



First measures *Sus une fontayne* ;

6. I. Bent (ed.), " Johannes Ciconia ", *Polyphonic Music of the 14th Century*, Monaco, 1978 1990, 170-174.
7. Ensembles " Alla francesca " and " Alta ", *Johannes Ciconia*, CD OPS 30-101, Paris, 1994

FIGURE 2b.

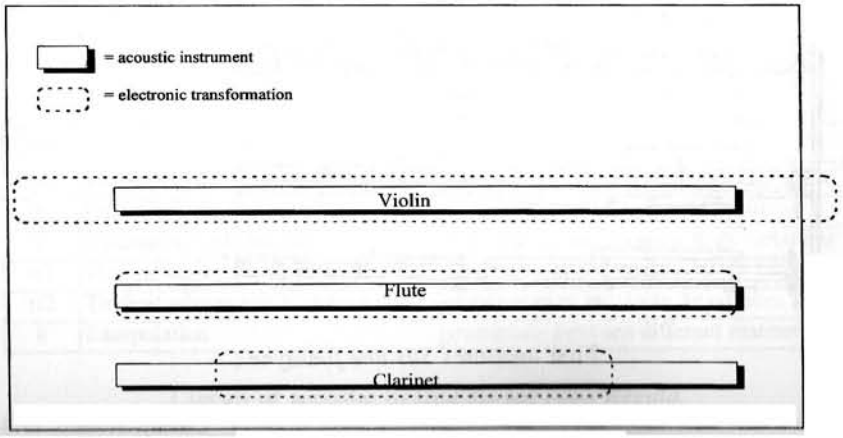


First measures *IV Felix Regula.*

ELECTRONIC TREATMENTS

The formal relationship between each instrument and its own electronic transformation have been thus determined as shown in figure 3.

FIGURE 3.



Formal schema for *IV Felix Regula.*

All the violin sounds are transformed and symmetrically distributed, but time stretched, around the middle of the violin part. So the first measures played by the instrument will be heard, electronically transformed, 50 seconds before their real production, while the lest electronic sounds are placed 50 seconds after their acoustic originals. The electronic transformation of flute is always simultaneous with the instrumental part, in a sort of live electronics simulation. The clarinet sounds, finally, are transformed, time compressed and symmetrically distributed around the middle of the instrumental part. The first measures played by the instrument will be heard electronically transformed after 40 seconds, while the lest electronic sounds will appear several seconds before their acoustic originals.

Then I choose the digital tools from those available at the *Centre de Recherches et Formation Musicales de Wallonie* in Liège. All the treatments of the instrumental sounds were clone on a Power Mac with Audiosculpt v. 1.2bl (IRCAM), Lemur Pro 4.0.1 (CERL Sound Group, University of Illinois) and MAX (Opcode) software. In this case too I built a timbre space to organize the electronic transformation (fig. 4). It is composed by 15 different processes — some of them with one or more variants — associated to the 5 acoustic treatments classes.

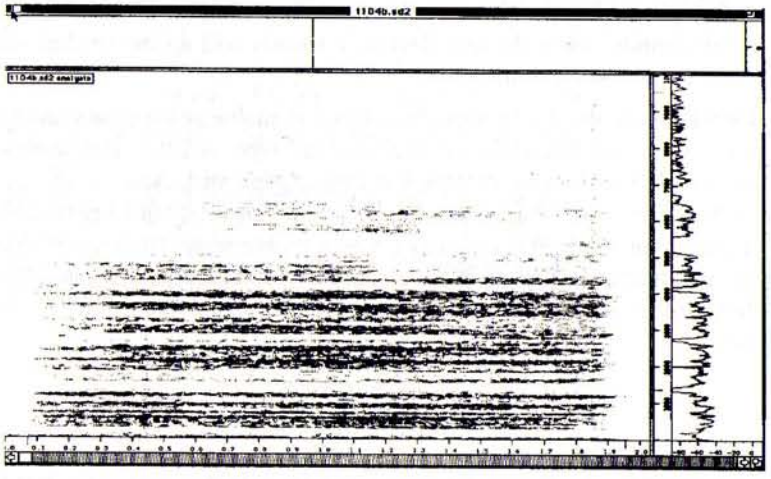
FIGURE 4.

Class	Sound production	Electronic processes
A	flutter-tonguing, *tremolo*	Cross synthesis with timbral trills
A	Timbral trills	*Vibrato* superposing
A	Timbral trills, *jeté, pizzicato*	Cross synthesis with multiphonics
A	flutter-tonguing , timbral trills, *jeté*	Time stretching of grains
B	Normal	Formantic filtering and microtonal textures
B	Normal	Spectrum transposition
B	Normal (low and high pitches)	Harmonizing
B	Mikrotones, random fragments	Dynamic time stretching
C	flutter-tonguing, *tremolo* and their variations	Cross synthesis with timbral trills
D1	Whistle tones	Spectrum stretching and compressing
D2	Multiphonics	Stocastic part extraction
D2	Slap, keystrokes, *pizzicato*	Time stretching and transposition
D2	Breathing, bow dragging	Filtering with analysis file
D2	Multiphonics	Dynamic filtering (*glissando*)
E	Transition between different productions	Granular morphing

Classes of electronic treatments for *Felix Regula.*

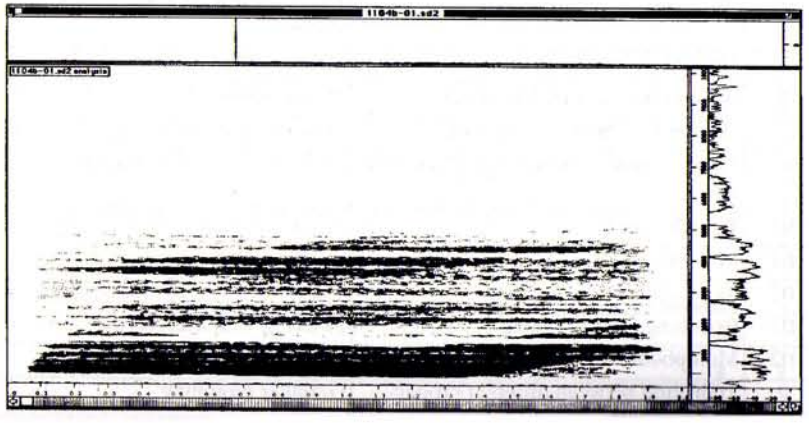
We will see now an example of transformation on violin sounds. Through the graphic filtering allowed by Audiosculpt on the sonogram of a *col legno* produced sound — very noisy — armonics are deleted (white rectangles in figure 5a). Then, with the same filtering tool, noisy regions of the spectrum are emphasized (+20 dB). See darker areas in figure 5b.

FIGURE 5a.



Deleting armonics from a violin sound (*col legno*) ;

FIGURE 5b.

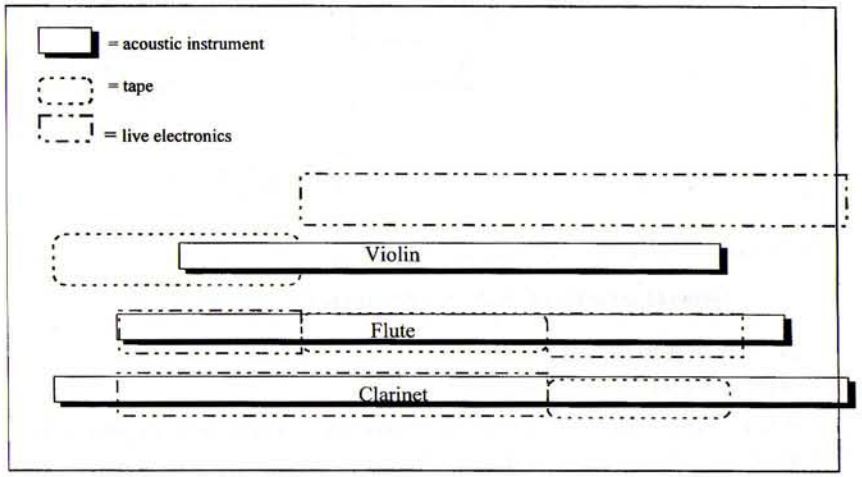


Emphasizing noisy regions.

5 HAPPY RULES

What results from all the instrumental and electronic parts is a 8 tracks tape with mono recordings of the instrument and " electronic clarinet ", and stereophonic recordings of violin and flute electronic transformations. This tape can be freely interpreted by a performer as concern tracks (minimum 3 tracks), dynamics and spatialization. During the mixing process I realized that each instruments with its own electronics could have independent life, which is true also for the single voices in Ciconia's *virelai*. So I decided to name *I Felix Regula* the clarinet and tape version, *II Felix Regula* the flute and tape version *III Felix Regula* the violin and tape version. *V Felix Regula* is a really different version. Because of the scoring which asks for the live instruments, *IV Felix Regula* tape and live electronics, but also from a formal point of view. Although the sound materials are quite the same, the structural relationships between instrument and electronics are changed, again in a mirroring game (fig. 6).

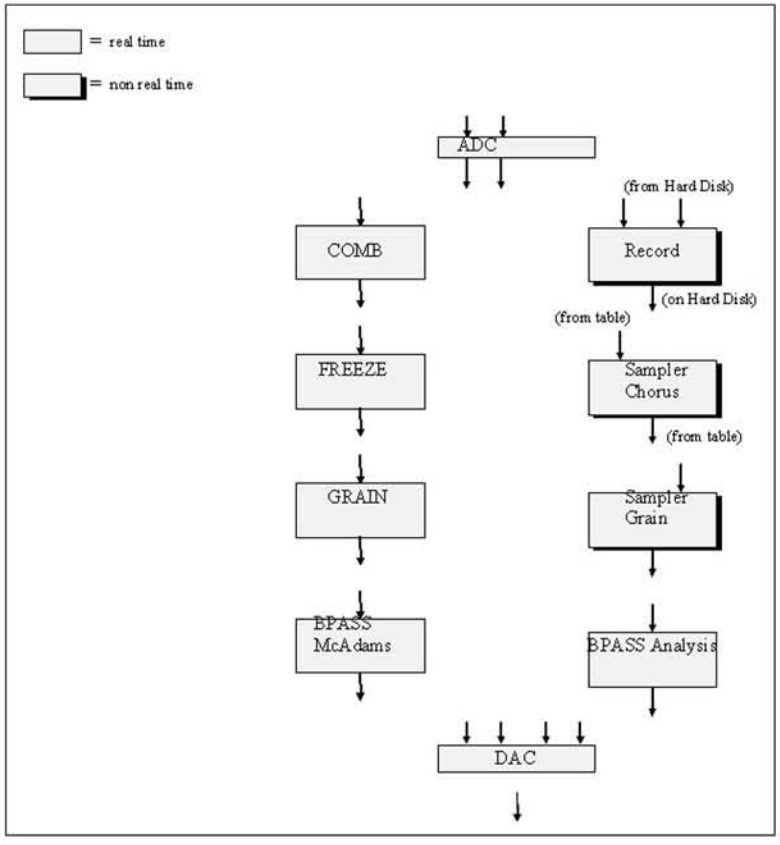
FIGURE 6.



Formal schema for *V Felix Regula.*

Live electronics is realized with the Next based IRCAM workstation - 2 DSP. Tape and live electronics are both used as safety margin during the performance and for a processing reduction reason. In fact I use only two of the four inputs available for live electronics, the third instrument, in turn, being supported by a tape part. Fig. 7 shows general schema of the MAX patches used.

FIGURE 7.



General schema of MAX patches used for *v Felix Regula.*

ADC = analog to digital conversion

COMB = stochastic part extraction

FREEZE = loop from a fragment, with possible transposition (4 modules)

GRAIN = random granulation (4 modules)

BPASS McAdams = band pass filtering with spectrum stretching and compressing (11 modules)

BPASS Analysis = filtering with amplitude/frequency determined by FFT analysis file (10 modules)

Record = table writing

Sampler Chorus = table reading for transposition and chorus (3 modules)

Sampler Grain = table reading for granulation (4 modules)

DAC = digital to analogue conversion

As concern the performance of the live electronics part, it was decided to write all the patches parameters in a list whose reading is controlled by a MIDI pedal activated by one of the performers. This allows a precision in the transforming algorithms comparable to that used to realize the tape. Dynamics, reverberation and spatialization are to be programmed each time according the acoustic characteristics of the concert space.