

# Conception and design of new mutes, real or virtual : thought process, results and technical stakes .

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## Overview

1. Ircam presentation.
2. Mutes presentation :
  - musical interest and semantic description
  - fixing mode classification
  - effects on tone (level, spectral composition, transients, spatial properties) and *playability*, tuning ...
  - relation between the effects and internal and external shapes, fixing modes, materials ...
3. Description of sounds based on perceptual features.
4. Conception and design of new mutes : French horn wa-wa mute.
5. Mutes in virtual world : the Brass project.

## 1. Ircam presentation

In 1969, Georges Pompidou initiated the establishment entrusting its direction to the composer and conductor Pierre Boulez.

His objective was bring science and art together in order to widen instrumentarium and rejuvenate musical language.

With the arrival of Laurent Bayle in 1992, the institution opened its doors to new artistic forms and worked at attracting a larger public.

Since 2002, the philosopher Bernard Stiegler has taken over Ircam's direction reaffirming the primary vocation of the Institute. The direction is firmly based in contemporary questions such as the links between cultural industries and creation.

## 2. Mutes presentation

Musical interest and semantic description

- . request from composers or brass players
- . extend tonal possibilities of instruments (5 or 6 mutes)



« ... la sourdine, qui est ordinairement faite d'un morceau de bois, que l'on met dans le pavillon de la trompette, afin qu'elle la bouche tellement qu'elle en diminue et en assourdisse les sons ».

« α, β, γ, δ, ε montrent le côté que l'on pousse dedans, et ζ, η signifient l'autre bout, par lequel on la tient en la poussant dedans ledit pavillon. quoique l'on puisse user d'autres inventions pour diminuer et empêcher la violence et l'éclat de la trompette en bouchant une partie de son ouverture. Or l'on use de cette sourdine, quand on ne veut pas que la trompette s'entende du lieu où sont les ennemis, comme il arrive au siège des villes et lorsque l'on veut déloger. Mais il est difficile de savoir de combien la sourdine diminue le son, car l'on peut seulement dire qu'il est d'autant plus faible qu'il s'entend de moins loin... Or il faut remarquer que cette sourdine est percée tout au long depuis la bouche a jusqu'à la patte ζ, η... »

Marin Mersenne, "Harmonie Universelle", 1636.



**Toccata from l'Orfeo, 1607 :**

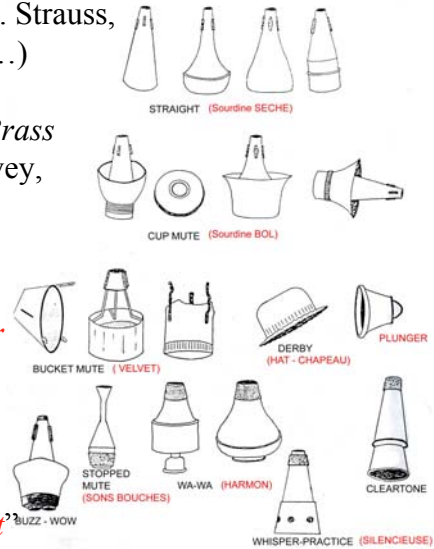
« Toccata che si suona avanti il levar de la tela tre volte con tutti li stromenti, e si fa un tuono più alto volendo sonar le trombe con le sordine »

Mutes presentation (2)

Orchestration method (H. Berlioz, R. Strauss, N. Rimsky-Korsakov...A. Copland...)

Articles, lectures, pieces of music (*Brass Bulletin*, P. Boulez, L. Berio, J. Harvey, M. Stroppa, Y. Maresz,...)

“muffled tone in pp”,  
 “similar to the timbre of oboe or English horn in mp and mf”  
 “weight”  
 “raucous, aggressive, harsh”  
 “strident, silver”  
 “distancing effect”



Mutes presentation (3)

Effects on tone (*loudness*)  
 spectral composition,  
 transients  
 spatial properties

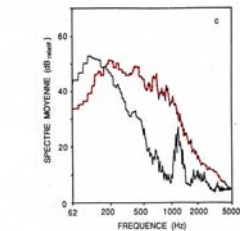
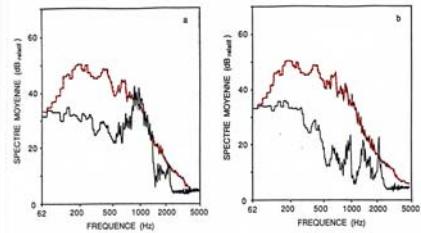
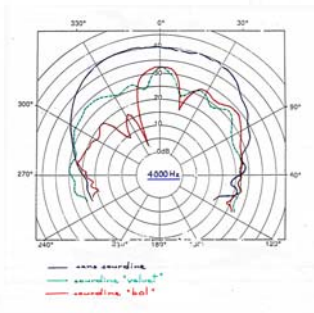
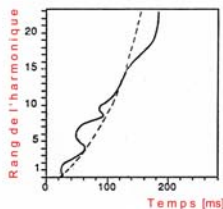
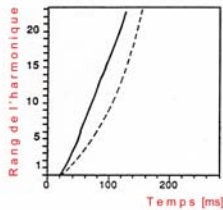
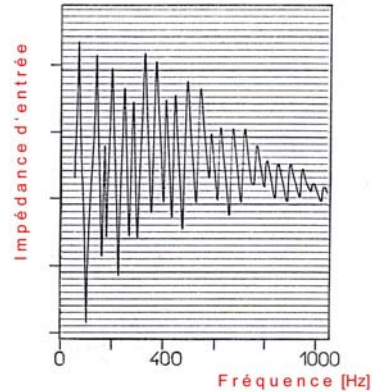
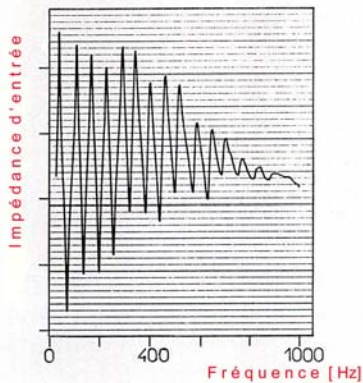


Fig. 38 : spectres moyennés du trombone sans (a) et avec wawa (b) et avec stem rentré (c), stem sorti (b) et sans stem (c).

## Mutes presentation (4)

Effects on *playability*, in/out of tune...



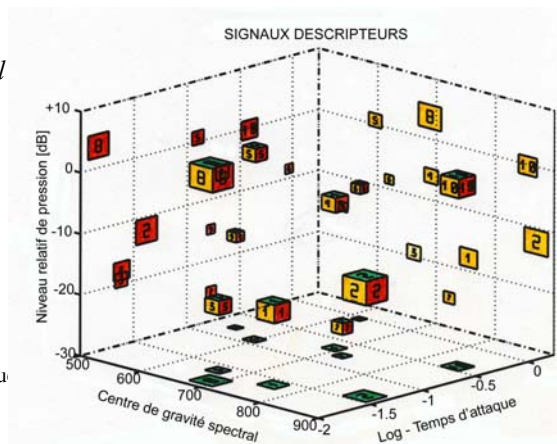
## 3. Description of sounds based on perceptual features

*Weight of sound force*  
(sonie or RMS)

CGS or *Harmonic Spectral Centroid*

(average over the sound duration of the amplitude weighted mean of the harmonic peaks of the spectrum).

*Log-attack time*  
(logarithm of the duration from the time when the signal starts to the minimum between the time when it reaches its maximum value or sustained part)



## 4. Conception and design of new mutes : French horn wa-wa mute.

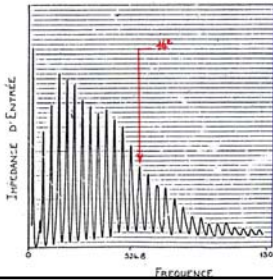
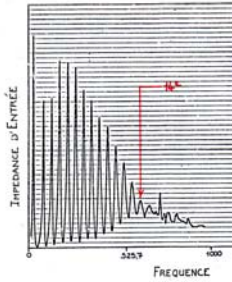
The wa-wa mute exists

What is the shape (at descriptors) ?

Why is not possible french horn ?

Use of sound simulation

The approach : “emj



Cor-en-Fa



y ?

ion and sound

29,5 Hz

85,2

133,2

176,9

221,4

263,0

307

351,3

395,1

439,3

483

525,7

569,1

or (trombone) to the

Fa<sub>4</sub>

Do<sub>3</sub> (130,8)

Fa<sub>3</sub> (174,6)

La<sub>3</sub> (220)

Do<sub>4</sub> (261,6)

Mi<sup>b</sup><sub>4</sub> (311,1)

Fa<sub>4</sub> (349,2)

Sol<sub>4</sub> (392,0)

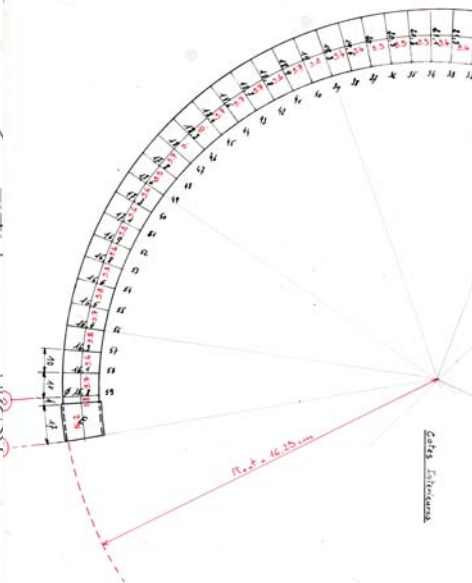
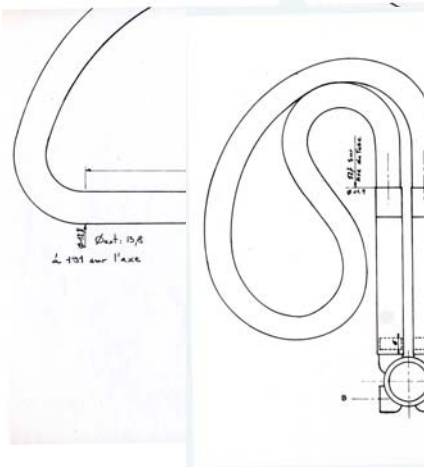
La<sub>4</sub> (440)

Si (493,8)

Do (523,2)



## Conception and design of new mutes : French horn wa-wa mute (2)





## Conception and design of new mutes : French horn wa-wa mute (5)



## 5. Mutes in virtual world : the Brass project.

Select the instrument you want to play

Select the preset style you want to play in

Import and Export presets

Use the virtual keyboard if you are not using a MIDI keyboard or controller.

Configure the instrument the way you want

Place instruments in the room

Open your MIDI settings

Set the range of your controllers, set it with the mouse and see the current value of each parameter.

and saxophone.

Create riffs with up to 4 different instruments

Choose the length, tempo and tonality of your riff

Import and export your riffs from and to MIDI files

Transpose your riffs in real time with a keyboard.

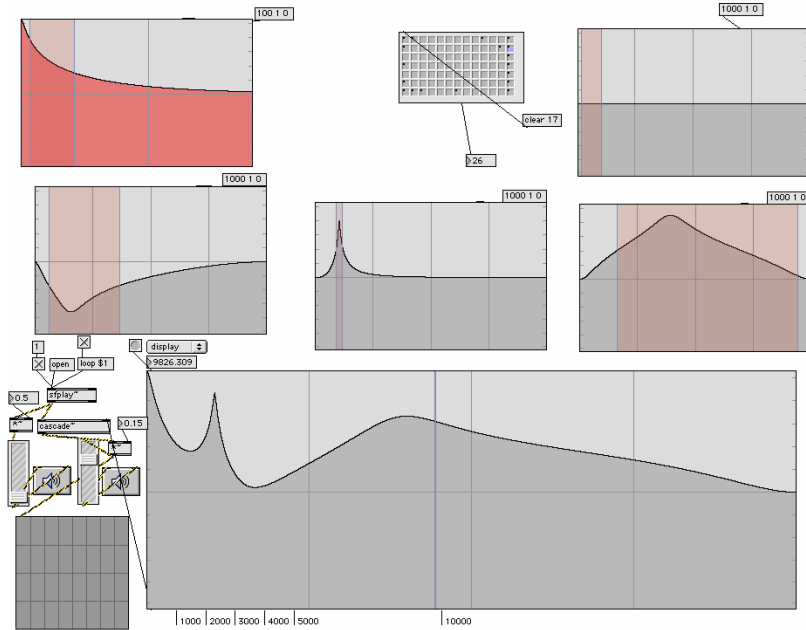
Configure each of the instruments playing the riff

Edit a riff directly in the built-in pianoroll editor

Position the different instruments playing the riff in a room the way you want

Select a riff thanks to the ergonomic explorer.

## Mutes in virtual world : the Brass project (2)



## Mutes in virtual world : the Brass project (3)

