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**Innovative Tools and Methods to Teach Music and
Signal Processing**

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Hybrid Cello

Discovering a new cello world

Summary

• Introduction

• Making and Learning: historical abstract

- Relation between makers, musicians and composers
 - Technical developments and cello's transformations
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• Musique mixte

- Problematic
 - Investigation
 - Hybrid cello
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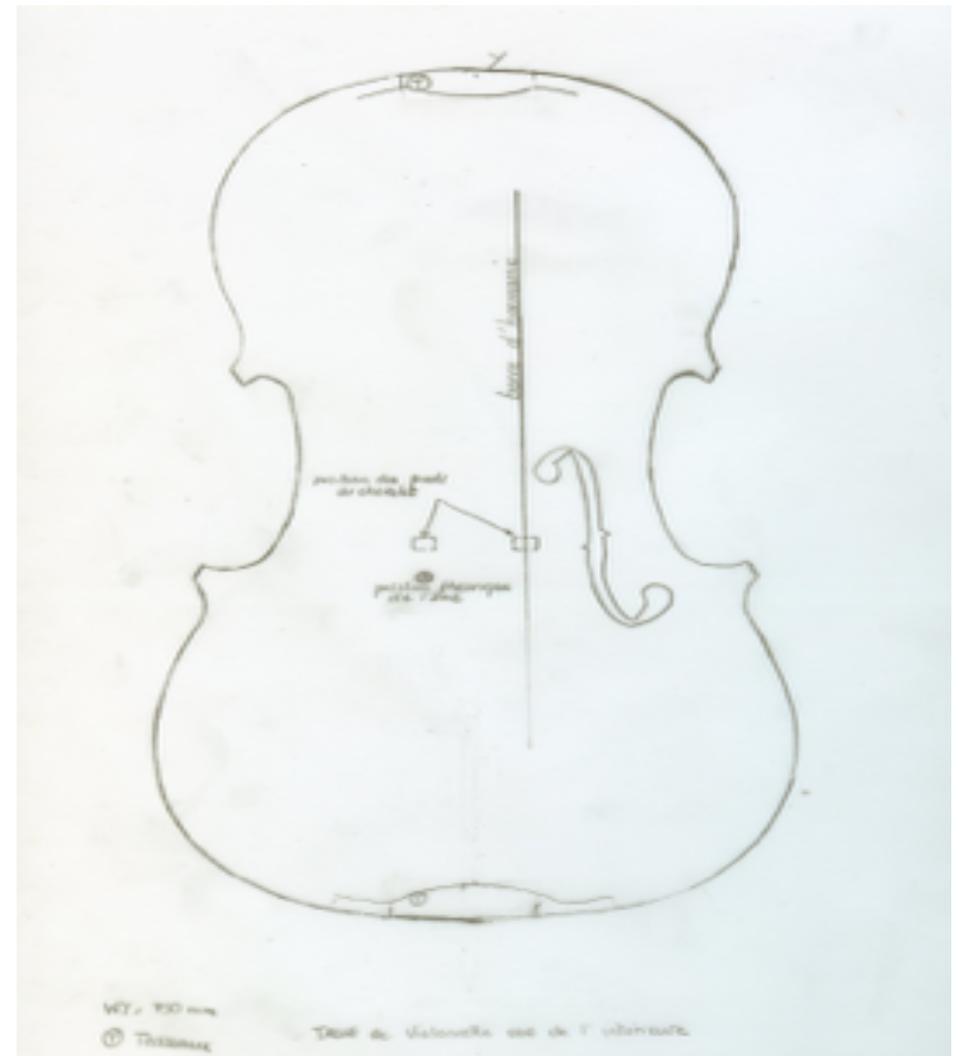
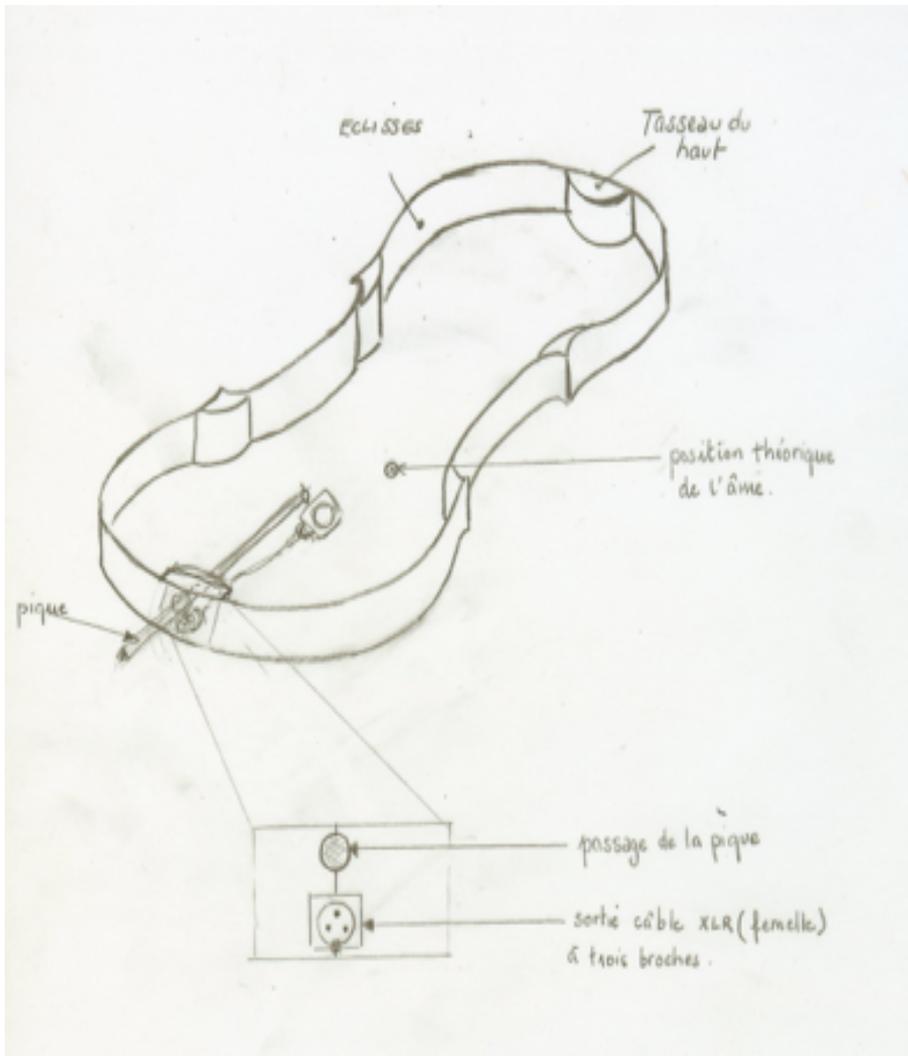
• Electronic statement in the learning cello

- Appraisal
 - Gestures
 - Transmission
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• The hybrid cello : the device

- Pedagogical instrument
- Integration of electronic repertory in the learning

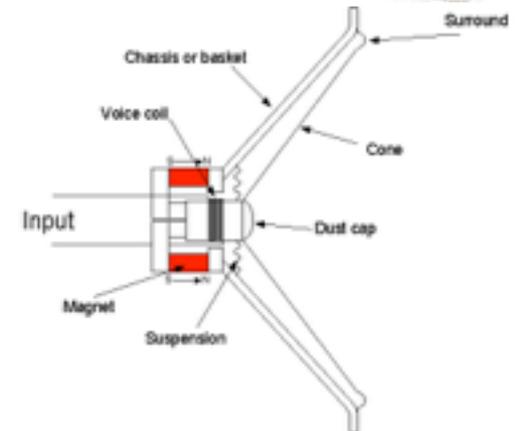
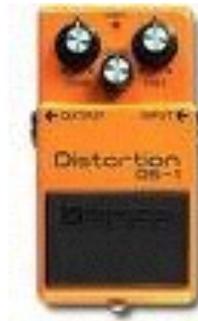
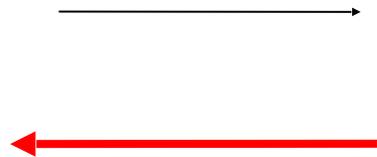
Introduction : description



Hybrid cello opened



Hybridation acoustique/électronique



Making and Learning : historical abstract

Relation between luthiers, musicians and composers

- **birth of the cello**

- Brescia, Italy, Cremona, Gasparo da Salo (1542-1609), Amati Andrea. Amati worked and middle format. Stradivarius Antonio (1644_1737) fixed the dimensions of the cello, and still universally adopted.

- **Italian musicians developed themselves their instruments**

- The Italian instrumentists devoted themselves to study the instruments of string quartet so, composers started to compose for these instruments ; Andrea Gabrieli, Monteverdi, Corelli, Vivaldi, Boccherini, Locatelli...

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- **Often these composers are also virtuosos musicians.**

Nothing better from these Italian Masters



MIDDLE 16th CENTURY

Violoncelle The King by Andrea Amati,



1707

Violoncelle Paganini Countess of Stainless, by Antonio Stradivarius

Technical developments and cello's transformations

- **Thumb position**

- Francesco Alborea, dit Franciscello, 1691-1739

- **Adding the pike**

- François Servais(1846)

- **Lenght of the handle**

- Bocherini Luigi

- **Camber of the bridge**

- **Concertos more and more virtuosos**

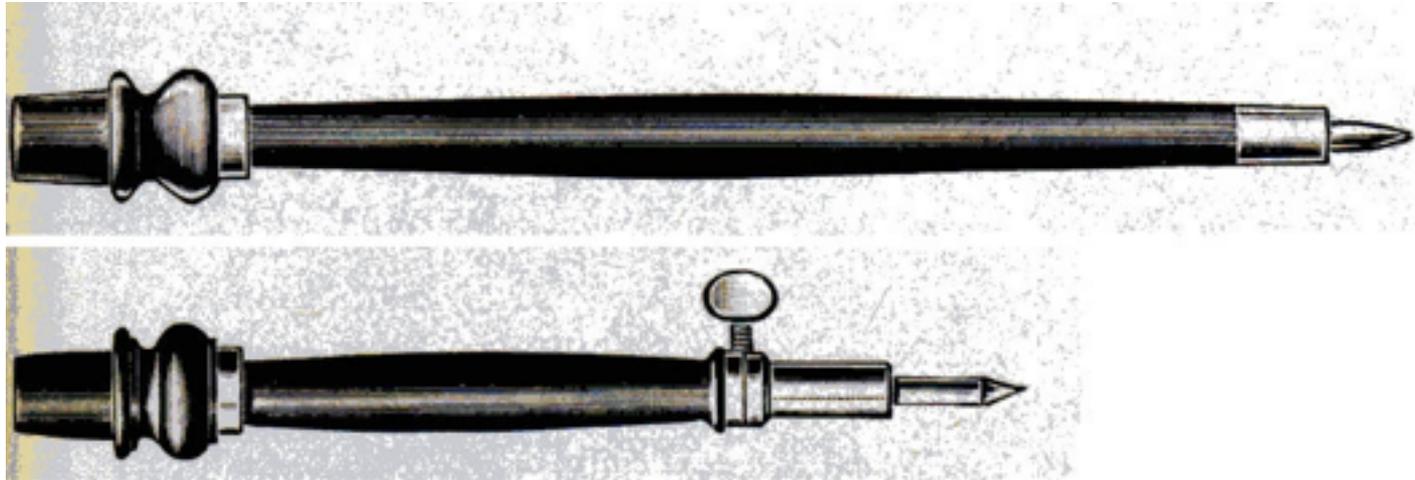
- **Studies for students composed by great cellists like Duport, Servaix, Romberg,Barrière (1707)**

- **Recently, Popper David, Starker, Feuillard, Palm**

Evolution of the bridge



Evolution of Pike



Dans la courte histoire du piquet, puis de la pique, il y a eu surtout deux modèles: une pique Hill, petite poire-bouton en bois percée d'une vis de serrage et une tige acier fine et courte (au début moins de 20cm), et la pique Mirecourt en deux parties bois (le bouton fixe et le piquet démontable), encore en vente à Markneunkirchen en 1928.



Marine Trumpet



New technics on historical instruments: Be a visionary



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- In Paris, the gamba was still preferred until 1725 but was really appreciated with Bocherini in 1768 in Concert Spirituel. At the beginning they were still playing both instruments but not so well. **Auguste Tolbecque (1830-1919) said :**
« LIFE IS TOO SHORT TO LEARN BOTH INSTRUMENT FROM THE PAST AND FROM THE PRESENT »
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- In Paris, the use of the pike was admitted very late with Delsart and Rabaud in the late XIX century
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- **The hybrid cello, a visionary instrument of the XXI century.**

Difficulties related to the music mixed

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- **Relationship between the musician and electronics**
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- **Technical knowledge by the musicians**
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- **Rehearsals logistics**
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- **Knowledge and analysis of the scores of music mixed**
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- **Diffusion of the repertory**
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- **Sound Diffusion by loudspeakers (2sound sources)**



The hybrid cello solves the interpretation of the whole repertory

State of electronic in the teaching cello

• **Appraisal**

- Ignorance of the repertory
 - Logistical obstacles
 - Lack of time in the teaching (30 min/week, or 20h/year)
 - Lack of repertory for small levels
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• **Gestures**

- Musical gesture impacts the electronic result
 - Beginning of the consciousness of the impact of the gesture
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• **Transmission of repertory**

Problematic of the evolution of softwares

Hybrid Cello : a solution

- **An asset in teaching cello**

SOME EXAMPLES IN THE FOLLOWING VIDEOS :

- rythmical solutions,
- precision in bow attack, equality of vibrato
- Practising frequency shift processing in a scale

- **Developing the classical ear**

- **Integration in the cello training of teaching contemporary repertory.**

