

# BioAcoustics Winter School

3<sup>rd</sup> Ed.



January 6-17, 2020

To apply please visit:

<https://sensoryneuroetholo.wixsite.com/enes/bioacoustic-winter-school>

## **BWS speakers**

### ***ENES Lab (University of Lyon / Saint-Etienne)***

Nicolas Mathevon, Prof. (BWS organizer)  
Frédéric Sèbe, Assoc. Prof. (BWS organizer)  
Joël Attia, Assoc. Prof.  
Marilyn Beauchaud, Assoc. Prof.  
Michael Greenfield, Prof, Research Associate  
Florence Levréro, Assoc. Prof.  
Vincent Médoc, Assoc. Prof.  
David Reby, Prof.  
PhD students, post-docs

### ***External speakers***

Olivier Adam, Prof. Univ. Paris-Sorbonne  
Thierry Aubin, Senior Researcher, CNRS  
Yves Bas, Researcher, Museum National Histoire Naturelle  
Elodie Briefer, Senior scientist, ETH Zurich  
Isabelle Charrier, Senior Researcher, CNRS  
Sébastien Derégnaucourt, Prof. Univ Nanterre  
Paulo Fonseca, Prof. Univ. Lisbon  
Julien Meyer, Researcher, CNRS  
Andrea Ravignani, post-doc Vrije Universiteit Brussel  
Colleen Reichmuth, Senior Researcher Univ.Calif. Santa Cruz  
Fanny Rybak, Assoc. Prof. Univ.Paris-Sud  
Jérôme Sueur, Assoc. Prof. MNHN  
Frédéric Theunissen, Prof. Univ.Calif. Berkeley

## **Students should bring the following material :**

- laptop
- headphones
- softwares : PRAAT + Audacity + R with seewave package + Python + BioSound Python package

Please check that you're able to record your voice with your laptop.

## **Location:**

Faculté des Sciences & Techniques, 23 rue du Dr. Paul Michelon, 42100 Saint-Etienne

Students registered at BWS follow all courses and practicals listed below.

**In bold:** courses open to students from the master of Ethology UJM and not registered at BWS.

## Day 1 (Monday, January 6<sup>th</sup>, 2020)

### **8h30-12h30**      **What is a sound signal I? (N.Mathevon & F.Sebe)**

*Acoustic waves, digital acquisition, amplitude and measuring dB*

### **13h30-15h30**      **What is a sound signal II? (N.Mathevon & F.Sebe)**

*Time/frequency representations, acoustic parameters, sound propagation, filters*

*Short introduction to classical softwares (Goldwave, Praat, Avisoft, seewave)*

### **16h-20h**      **Students' projects warm-up (D.Reby, N.Mathevon & F.Sebe)**

*Groups of 5 students (material: their own phones and/or computers + free apps)*

*Examples of possible projects:*

- ***The campus soundscape. I- the noise.** (objective: mapping the variation of intensity level on the La Métare Campus –in and out the classrooms; method: recording + measuring the dB level of the background noise with phone apps at different hours and locations on the campus + characterizing the entropy and biodiversity indexes*
- ***The campus soundscape. II- Biodiversity.** (objective: mapping the acoustic diversity on the La Métare Campus; method: recording the soundscape with phone apps at different hours and locations on the campus + characterizing the entropy and biodiversity indexes*
- ***The circadian rhythm of voice pitch** (objective: testing if the pitch of an individual's voice changes during the day; method: recording of students' voices at different moments during the day + psycho-acoustic tests to evaluate if we're sensitive to these changes in voice "Please tell when during the day this voice has been recorded")*
- ***Voice features and individual size** (objective: testing how voice pitch and spectrum depend on an individual's size ; method: recording students' voices + measuring their size & correlates + psycho-acoustic test to see if we're able to assess the size of an individual from her/his size –confounding effect = sex)*
- ***Politicians' voices and election issues** (objective: is it possible to predict the issue of an election from vocal features measured during a political debate?; method: analysis of recordings –political debates available on the net- + psychoacoustic tests of students?)*
- ***Lombard effect** (objective: do we modify the amplitude of our voice depending on the level of the background noise – methods : playback of noise of different levels through headphones + recording of speech + measure of amplitude)*
- ***Characterizing a loudspeaker for a bioacoustics experiment** (objective: determining which is the best loudspeaker for an experiment on woodpecker drumming – methods: playback of white noise + woodpecker drummings in the sound-proofed chamber + comparison with original signals)*
- ...

*Students' expected production:*

*\*Poster (1 page) : Scientific context, problematic, hypothesis, method, results, discussion*

*\*Powerpoint (15 minutes max).*

## Day 2 (Tuesday, January 7<sup>th</sup>, 2020)

### **8h-12h**      **Signal processing 1 (with a focus on PRAAT -D.Reby)**

*- Practicals 1: Introduction to PRAAT (signal manipulation -editing, resampling...) + analysis of mammal vocalizations (Frequency analysis -spectrogram, spectrum, formants...; Time analysis)*

### **14h-18h**      **Signal processing 2 (with a focus on PRAAT -D.Reby)**

*- Practicals 2: Analysis and re-synthesis of human voice with PRAAT*

## Day 3 (Wednesday, January 8<sup>th</sup>, 2020)

**8h-12h**      **The recording and emission chains - Problems and solution**  
**& 14h30-18h30**      **(microphones, loudspeakers, recorders) – Practicals**  
**(M.Greenfield, N.Mathevon & F. Sèbe)**

**Aquatic bioacoustics: from sound to silico – Practicals**  
**(P.Fonseca)**

13h-14h                      Technical support for students' project (*D.Reby, N.Mathevon & F.Sebe*)

19h-22h                      **Evening event (to be defined)**  
(open to the public)  
Maison de l'université, 10 rue Tréfilerie, Saint-Etienne

#### **Day 4 (Thursday, January 9<sup>th</sup>, 2020)**

9h-12h & 14-17h      *Field experiment - Practicals I* (Human bioacoustics -Propagation of human voice - Field experiment – (*J.Meyer*))

9h-12h & 14-17h      How to analyse vocal signatures (with a practical with PRAAT & seewave)  
(*N.Mathevon & F.Sebe*)

12h-13h                      Technical support for students' project (*D.Reby, N.Mathevon & F.Sebe*)

**16h30-18h                      Emotion coding in acoustic signals (*E. Briefer*)**

**18h-19h                      Fish bioacoustics (*M.Beauchaud*)**

#### **Day 5 (Friday, January 10<sup>th</sup>, 2020)**

**8h30-12h30                      Introduction to ecoacoustics – (*J.Sueur*)**

14h-17h                      Signal processing with the seewave R package (*J.Sueur*)  
*practicals 3: time frequency analysis and visualization, ecoacoustic analysis*

17h-19h                      Technical support for students' project (*D.Reby, N.Mathevon & F.Sebe*)

#### **Day 6 (Monday, January 13<sup>th</sup>, 2020)**

**8h - 11h                      Rhythmic patterns (*A.Ravignani*)**

**11h30-13h30                      Bioacoustics as a tool for social network studies (monkeys and apes) (*F.Levréro*)**

**14h-17h                      Birdsong studies in the laboratory: technical advances in tracking vocal changes (*S.Derégnaucourt*)**

16h-18h                      Signal processing 3 – *Practicals* (*F.Sebe*)  
*Graphical synthesis, automatical research of templates*

18h-20h                      Signal processing 5 – BioSound Python package  
(*F.Theunissen* – VIDEO CONFERENCE)

<b>Day 7 (Tuesday, January 14<sup>th</sup>, 2020)</b>
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<b>8h-9h30</b>	<b>Information theory</b> ( <i>T.Aubin</i> )
<b>9h30-10h30</b>	<b>The noise</b> ( <i>T.Aubin</i> )
<b>11h-12h</b>	<b>Coding strategies in song of songbirds</b> ( <i>T.Aubin</i> )
<b>14h30-18h30</b>	<b>Field experimentations in bioacoustics: problems and solutions</b> ( <i>I.Charrier</i> )
<b>18h30- 21h</b>	<b>Field bioacoustics in movies</b> ( <i>N.Mathevon &amp; F.Sèbe</i> ) "Bonjour les morses" <a href="http://videotheque.cnrs.fr/doc=2019">http://videotheque.cnrs.fr/doc=2019</a> "Capitaine de la forêt" <a href="http://videotheque.cnrs.fr/doc=2846">http://videotheque.cnrs.fr/doc=2846</a> "Crocodile melody" <a href="http://videotheque.cnrs.fr/doc=4168">http://videotheque.cnrs.fr/doc=4168</a> "Les chants de la mer" <a href="http://www.universcience.tv/video-les-chants-de-la-mer-11660.html">http://www.universcience.tv/video-les-chants-de-la-mer-11660.html</a>

<b>Day 8 (Wednesday, January 15<sup>th</sup>, 2020)</b>
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<b>8h – 12 h</b>	<b>Whales' bioacoustics</b> ( <i>O.Adam</i> )
<b>14h – 15h30</b>	<b>Acoustic survey of animal populations: Detection and automatic classification of bats' echolocation calls</b> ( <i>Yves Bas</i> )
<b>15h30 – 17h</b>	Classification of bat's echolocation calls – <i>Practicals</i> ( <i>Yves Bas</i> )
<b>18h-20h</b>	Psychoacoustics of Marine mammals: behavioral conditioning, auditory curves and impact of subaquatic noise ( <i>C.Reichmuth – VIDEO CONFERENCE</i> )

<b>Day 9 (Thursday, January 16<sup>th</sup>, 2020)</b>
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<b>8h-10h &amp; 10h-12h</b>	<i>Field experiment - Practicals II (Triangulation)</i> ( <i>N.Mathevon &amp; F.Sebe</i> )
<b>8h-10h &amp; 10h-12h</b>	The use of sound libraries for conservation and scientific studies ( <i>N.Mathevon</i> )
<b>12h-14h</b>	Technical support for students' project ( <i>D.Reby, N.Mathevon &amp; F.Sebe</i> )
<b>14h – 16h</b>	<b>Bioacoustics as a monitoring tool for fresh waters</b> ( <i>F.Rybak</i> )
<b>16h – 18h</b>	<b>Acoustic studies in Arthropods</b> ( <i>F.Rybak</i> )

<b>Day 10 (Friday, January 17<sup>th</sup>, 2020)</b>
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- 8h – 8h45**                    **The International Bioacoustic Council, other structures, scientific journals and potential fundings opportunities in bioacoustics**  
(*N.Mathevon*)
- 9h-13h**                      **Current research topics at the ENES lab**  
(*ENES PhD students & post-docs; J.Attia, N.Mathevon, V.Médoc, F.Sèbe*)
- 14h-18h**                    **Final exam**  
1. **multiple choice test (45 minutes)**  
2. oral presentation by students (*each group of students will present its project in 15 minutes*)
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