

BioAcoustics Winter School

7th Ed.



January 3-17, 2023

BWS speakers

Université de Saint-Etienne (ENES Lab)

Nicolas Mathevon, Prof.
Frédéric Sèbe, Associate Prof.
Joël Attia, Associate Prof.
Marilyn Beauchaud, Associate Prof.
Michael Greenfield, Prof, Research Associate
Florence Levréro, Associate Prof.
Vincent Médoc, Associate Prof.
Kasia Pisanski, CNRS researcher
David Reby, Prof
PhD students, post-docs

External

Olivier Adam, Prof Univ. Sorbonne
Jean-Yves Barnagaud, Ecole Pratique des Hautes Etudes
Yves Bas, Museum National Histoire Naturelle
Elodie Briefer, University of Copenhagen, Denmark
Isabelle Charrier, Senior Researcher CNRS
Tudor Draganiou, Prof, Univ Nanterre
Paulo Fonseca, Prof, Univ. Lisbonne
Hervé Glotin, Prof, Univ Toulon
Mirjam Knörnschild, Group Leader, Museum für Naturkunde Berlin
Andrea Ravnani, Researcher, Max Planck Institute
Colleen Reichmuth, Senior Researcher Univ.Calif. Santa Cruz
Fanny Rybak, Associate Prof, Univ.Paris-Sud
Jérôme Sueur, Associate Prof, MNHN
Simon Townsend, Professor, University of Zurich

Students should bring the following equipment:

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

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.

In bold: courses open to BWS students and students from the *master of Ethology* and the *master of acoustics* – Univ.St-Etienne & Univ.Lyon.

All other courses & practicals: open only to BWS students.

Day 1 (Tuesday, January 3rd, 2023)

10h-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 - oscillogram, spectrogram, FFT spectrum

Acoustic parameters, sound propagation, filters - Digitalization

Short introduction to classical softwares (Goldwave, Avisoft, seewave) - Short practical on Audacity

Introduction to microphones and loudspeakers

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 biacoustics 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 (Wednesday, January 4th, 2023)

9h-12h **Vocal communication in mammals (D.Reby)**

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

- Practicals: Introduction to PRAAT (signal manipulation -editing, resampling...) + analysis of mammal vocalizations (Frequency analysis -spectrogram, spectrum, formants...; Time analysis); Analysis and re-synthesis of human voice with PRAAT

Day 3 (Thursday, January 5th, 2023)

- 8h30-11h30 Statistics for bioacoustics (*JY Barnagaud*)
- 13h-14h30 Sound analysis software (*F.Sèbe*)
- 15h – 18h **The vocal expression of emotions (*E.Briefer - online*)**
- 19h30-22h **Evening event (open to the public)**
Maison de l'université, 10 rue Tréfilerie, Saint-Etienne

Day 4 (Friday, January 6th, 2023)

- 8h30-17h30 The recording and emission chains - Problems and solution
(microphones, loudspeakers, recorders) – *Practicals (M.Greenfield,
N.Mathevon & F.Sèbe)*

Day 5 (Monday, January 9th, 2023)

- 8h30-12h30 **Introduction to ecoacoustics – (*J.Sueur - online*)**
- 12h30-14h Technical support for students' project
(*D.Reby, N.Mathevon & F.Sebe*)
- 14h-16h **Long-term research in bioacoustics: A case study in the black
redstart (*T.Draganiou*)**
- 16h-18h Technical support for students' project
(*D.Reby, N.Mathevon & F.Sebe*)

Day 6 (Tuesday, January 10th, 2023)

- 8h30-10h **Coding strategies in bird songs (*N.Mathevon*)**
- 10h30-12h30 **Diversity and function of bat vocalizations (*Mirjam Knörnschild
online*)**
- 14h30-18h30 **Field experimentations in bioacoustics: problems and solutions
(*I.Charrier*)**

19h- 21h **Field bioacoustics in movies**
(*N.Mathevon & F.Sèbe*)

Day 7 (Wednesday, January 11th, 2023)

8h30-12h30 Title to be confirmed (*S.Townsend*)

14-17h Aquatic bioacoustics: from sound to silico – *Practicals*
(*P.Fonseca*)

Day 8 (Thursday, January 12th, 2023)

8h - 12h Rhythmic patterns (*A.Ravignani*)

14h - 18h Acoustic survey of animal populations: Detection and automatic classification of bats' echolocation calls (*Y.Bas*)

18h - 20h Psychoacoustics of Marine mammals: behavioral conditioning, auditory curves and impact of subaquatic noise (*C.Reichmuth – on-line*)

Day 9 (Friday, January 13th, 2023)

8h – 12 h **Whales' bioacoustics** (*O.Adam*)

12h -14h Technical support for students' project
(*D.Reby, N.Mathevon & F.Sebe*)

14h – 18h Artificial Intelligence and Bioacoustics (*H.Glotin*)

Day 10 (Monday January 16th, 2023)

10h-12h **Bioacoustics as a tool for social network studies (monkeys and apes)** (*F.Levréro*)

14h – 16h **Bioacoustics as a monitoring tool for fresh waters** (*F.Rybak*)

16h – 18h **Acoustic studies in Arthropods** (*F.Rybak*)

Day 11 (Tuesday January 17th, 2023)

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
(*J.Attia, M.Beauchaud, V.Médoc, K.Pisanski, ENES PhD students & post-docs*)

14h-17h **Final exam**
