BIOACOUSTICS RESEARCH LAB

BioAcoustics Winter School

8th Ed.

January 8-19, 2024

PROVISIONAL PROGRAM

BWS speakers

University of Saint-Etienne (ENES Bioacoustics Research Lab)
Nicolas Mathevon, Prof. (BWS organizer)
Frédéric Sèbe, Associate Prof. (BWS organizer)
Andrey Anikin, Post-doc
Michael Greenfield, Prof, Research Associate
Florence Levréro, Associate Prof.
David Reby, Prof
Other ENES Associate Professors & Researchers (J.Attia, M.Beauchaud, V.Médoc, K.Pisanski)
ENES 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
Sébastien Derégnaucourt, Prof, Univ Nanterre
Paulo Fonseca, Prof, Univ. Lisbonne
Hervé Glotin, Prof, Univ Toulon
Mirjam Knörnschild, Group Leader, Museum für Naturkunde Berlin
Andrea Ravignani, Researcher, Max Planck Institute
Colleen Reichmuth, Senior Researcher Univ.Calif. Santa Cruz
Tony Robillard, Professor, Museum National d'Histoire Naturelle, Paris
Fanny Rybak, Associate Prof, Univ.Paris-Sud
Jérôme Sueur, Associate Prof, Museum National d'Histoire Naturelle, Paris
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.

Online talks: https://ujmstetienne.webex.com/meet/nicolas.mathevon

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 (Monday, January 8th, 2024)

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, J.Y.Barnaud)*
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 theses 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 (Tuesday, January 9th, 2024)

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

13h-14h30 Decibels and other useful acoustics (*M. Greenfield)*

14h30-18h30 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 (Wednesday, January 10th, 2024)

8h-9h	Presentation of the practicals (*M. Greenfield*)
9h15-12h15	1st half group of students: The recording and emission chains Problems and solutions (Practicals; *M.Greenfield*)
	2nd half group of students: SOUNDGEN & other R packages for sound analysis (Practicals; *A Anikin*)
14h-17pm	1st half group of students: SOUNDGEN & other R packages for sound analysis (Practicals; *A Anikin*)
	2nd half group of students: The recording and emission chains Problems and solution (Practicals; *M.Greenfield*)

Day 4 (Thursday, January 11th, 2024)

8h30-12h30	**Introduction to ecoacoustics** – (*J.Sueur - online*)
12h30-14h	Technical support for students' project *(D.Reby, N.Mathevon & F.Sebe)*
14h-16h	**Birdsong studies in the laboratory: technical advances in tracking vocal changes** *(S. Derégnaucourt)*
18h-20h	**Evolution of communication in crickets (*T. Robillard*)**
20h-21h	Technical support for students' project *(D.Reby, N.Mathevon & F.Sebe)*

Day 5 (Friday, January 12th, 2024)

8h – 11h30 The vocal expression of emotions (*E.Briefer - online)*

11h45-12h45	**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 6 (Monday, January 15th, 2024)

8h30-11h30	Statistics for bioacoustics (*JY Barnagaud)*
11h30-13h	**Language origins: an animal communication perspective (*S.Townsend*)**
14-17h	Aquatic bioacoustics: from sound to silico – *Practicals* (*P.Fonseca*)
19h30-22h	**Evening event (open to the public)** **Maison de l'université, 10 rue Tréfilerie, Saint-Etienne**

Day 7 (Tuesday, January 16th, 2024)

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	Understanding the acoustic world of animals from within *(C.Reichmuth – online)*

Day 8 (Wednesday, January 17th, 2024)

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 9 (Thursday January 18th, 2024)

8h-10h	**Coding strategies in bird songs** *(N.Mathevon)*

10h15-12h15	**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 10 (Friday January 19th, 2024)

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**
