

**ENES BIOACOUSTICS  
RESEARCH LAB**

# BioAcoustics Winter School

8<sup>th</sup> Ed.

January 8-19, 2024

## **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.

Florence Levréro, Associate Prof.

David Reby, Prof.

Jérémy Rouch, Research Engineer

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

Elodie Briefer, University of Copenhagen, Denmark

Isabelle Charrier, Senior Researcher CNRS

Tudor Draganoiu, Associate Prof, Univ Nanterre

Paulo Fonseca, Prof, Univ. Lisbonne

Hervé Glotin, Prof, Univ Toulon

Mirjam Knörnschild, Prof, Humboldt University Berlin

Colleen Reichmuth, Senior Researcher Univ.Calif. Santa Cruz

Andrea Ravnani, Professor, University of Roma

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*.**

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

**Day 1 (Monday, January 8<sup>th</sup>, 2024)**

**9h30-10h30**            **What is bioacoustics? (N.Mathevon)**

**10h30-12h30**        **Information in sounds – from bioacoustics to ecoacoustics**  
(F.Sebe)

**13h30-16h30**        **What is a sound signal? (Jérémy Rouch)**

*Time/frequency representations - oscillogram, spectrogram, FFT spectrum*

*Acoustic parameters, sound propagation, filters - Digitalization*

*amplitude and measuring dB*

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

**16h30-17h30**        **From microphones to loudspeakers (N.Mathevon)**

*Introduction to microphones and loudspeakers*

**17h30-18h**            **Students' projects warm-up (D.Reby, N.Mathevon, F.Sebe, J. Rouch)**

*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 9<sup>th</sup>, 2024)**

**8h – 8h45**            **The International Bioacoustic Council, other structures, scientific journals and potential fundings opportunities in bioacoustics**  
(N.Mathevon)

**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 10<sup>th</sup>, 2024)

8h-9h              Presentation of the practicals (*M. Greenfield*)

9h15-12h15        1<sup>st</sup> half group of students: The recording and emission chains  
Problems and solutions (*Practicals; M.Greenfield*)

                          2<sup>nd</sup> half group of students: SOUNDGEN & other R packages for sound  
analysis (*Practicals; A Anikin*)

14h-17pm         1<sup>st</sup> half group of students: SOUNDGEN & other R packages for sound  
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Problems and solution (*Practicals; M.Greenfield*)

19h30-22h         **Evening event (open to the public)**  
**Maison de l'université, 10 rue Tréfilerie, Saint-Etienne**

**«Qu'est-ce que la voix ? »**

### Day 4 (Thursday, January 11<sup>th</sup>, 2024)

9h - 12h            **Rhythmic patterns in animal acoustic communication**  
**(*A.Ravignani*)**

12h30-14h        Technical support for students' project  
*(D.Reby, N.Mathevon & F.Sebe)*

14h-18h            **Introduction to ecoacoustics – (*J.Sueur*)**

### Day 5 (Friday, January 12<sup>th</sup>, 2024)

9h-10h             **Language origins: an animal communication perspective**  
*(S.Townsend)*

10h-11h            Technical support for students' project  
*(D.Reby, N.Mathevon & F.Sebe)*

**11h45-12h45**      **Diversity and function of bat vocalizations**  
(*Mirjam Knörnschild* online)

**14h-16h**            **Long-term research in bioacoustics: a case study in the black redstart** (*Tudor Draganiou*)

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

**Day 6 (Monday, January 15<sup>th</sup>, 2024)**

8h30-12h30        Statistics for bioacoustics (*JY Barnagaud*)

**14h30-18h30**      **Field experimentations in bioacoustics: problems and solutions**  
(*I.Charrier*)

**Day 7 (Tuesday, January 16<sup>th</sup>, 2024)**

**8h30-11h30**        **Evolution of communication in crickets** (*T. Robillard*)

14-18h              Aquatic bioacoustics: from sound to silico – *Practicals*  
(*P.Fonseca*)

18h - 20h          Understanding the acoustic world of animals from within  
(*C.Reichmuth – online*)

**Day 8 (Wednesday, January 17<sup>th</sup>, 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 18<sup>th</sup>, 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 19<sup>th</sup>, 2024)**

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

**11h30-12h15** Applications of bioacoustics (*F.Sèbe*)

**12h15-13h** Current research topics at the ENES lab  
(*J.Attia, M.Beauchaud, V.Médoc, K.Pisanski, ENES PhD students & post-docs*)

**14h-17h** Final exam

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