

Julie E. ELIE

Professional address

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Personnal information

Born: 22 July 1982, France
Fluent in French and English
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WHO I AM

I would introduce myself as a **computational neuroethologist**. My research is on vocal communication and its implications for social bonding. Songbirds are my main model system and I'm developing a new program of research with the zebra finch as a model system for communication and social neuroscience. I combine experiments in behavior and in neurophysiology, with state-of-the-art analyses in bioacoustics and neural modeling, to find out how the auditory brain extracts meaning from communication signals. More precisely my questions are: what information is encoded in acoustic features of vocalizations, how these vocalizations are represented in the auditory system, and how vocal communication is implicated in social bonding. My multidisciplinary approach ranges from the neural activity at the cellular level up to the social behavior of the animal.

POSITIONS

Jan. 2011-Now **Post-doctoral Fellow**. Research project : « *The auditory processing of an entire vocal repertoire in a social songbird.* ». Auditory Neurophysiology and Computational Neuroethology Lab, Psychology department & Helen Wills Neuroscience Institute, **University of California Berkeley (UCB)**, USA. Principal Investigator : Prof. Frédéric Theunissen.

Sept. 2007-Dec. 2010 **Teaching fellowship** in Biology, University Jean Monnet, Saint-Etienne, France and **PhD in Biological Sciences** « *Réseaux social et acoustique du Diamant mandarin: importance comportementale et neurophysiologique du lien d'appariement* » Sensory NeuroEthology Team (ENES-CNPS), National Center of Scientific Research **CNRS UMR 8195, University of Saint-Etienne, France**. PhD Advisors : Prof. Nicolas Mathevon & Prof. Clémentine Vignal. Collaborator : Prof. Hédi Soula, RMND INSERM U870, INSA Lyon.

2007 **Capes in Biological and Earth Sciences (national competitive exam for teaching abilities)**

2003-2007 “Normalien” Pupil at the **Ecole Normale Supérieure de Lyon**, France.

AWARDS AND SCHOLARSHIPS

Febr. 2014 **Travel grant** from the COSYNE 2014 committee. **\$500**

Sept. 2013 **NSF Project CRCNS « Auditory computations for interpreting and producing communication signal » (NSF 12-114)** French-American collaboration with Prof. Frédéric Theunissen and Prof. Hédi Soula (RMND INSERM U870, INSA Lyon). **718 114\$**

Mai 2012 **Research Fellowship** from The **Rose Hills Fondation** attributed to **Michelle R Carney \$6,000**

Jan. 2011 - Jan. 2013 **Post-doctoral Fellowship from the Fyssen Fondation. 50,000€**

Aug. 2012 **Registration waiver** to the 10th International Congress of Neuroethology.

March 2010 **Travel award** from the French Society of the Study of Animal Behaviour (SFECA). **250€**

March 2008 **Travel award** from the French Society of the Study of Animal Behaviour (SFECA). **250€**

Sept. 2007 - Dec. 2010 **3-year PhD scholarship of the French Ministry of Research** (‘Allocation couplée pour élève Normalien’). **60 000€**

Sept. 2003 – Aug 2007 **4-year scholarship** at the Ecole Normale Supérieure (ENS) de Lyon, France. **66 000€**

EDUCATION

2007-2010 **PhD in Biological Sciences** (University of Saint Etienne, France).

2006-2007 **2nd year of Master’s degree** (Master in Molecular and Cellular Biology, Ecole Normale Supérieure, Lyon, France).

Studied topics: Bioacoustics Master Course (University of Paris XI, Orsay, France), European Master Course of Neuroscience ‘Neocortex: Computation, Architecture and Development’ (Ecole Normale Supérieure, Lyon, France).

2005-2006 **Training classes to national competitive exams for teaching abilities** in Biological and Earth Sciences (Ecole Normale Supérieure, Lyon, France).

- 2004-2005 **1st year of Master's degree** (Master in Molecular and Cellular Biology, Ecole Normale Supérieure, Lyon, France).
- 2003-2004 **Bachelor's degree ("Licence") in Cellular and Molecular Biology**, Ecole Normale Supérieure de Lyon, France).
- 2002-2003 **DEUG (undergraduate studies) in General Biological Sciences** (University of Saint-Etienne, France).

FIELD AND PROFESSIONAL TRAINING

- 2015 **Berkeley winter Python Bootcamp: introductory course to programming in Python for bioinformatics** (1 week ; University of California, Berkeley, USA).
- 2011 **Berkeley summer course in Mining and modeling of neuroscience data** (2 weeks ; Redwood center for Theoretical Neuroscience, University of California, Berkeley, USA).
- Nov. 2008 **Four-week field work at Fowlers Gap Arid Zone Research Station, NSW Australia.** Subject : « *Acoustic monitoring of mate communication at nest in wild zebra finches* ». Collaborators : Prof. Simon Griffith & Dr Mylène Mariette. Macquarie University, Sydney, Australia.
- Feb. - Mars 2008 **Five-week field internship at Paimpont Research Station, France.** Subject : « *Acoustic monitoring of group-mates communication in a captive flock of starlings housed outdoor* ». Collaborators : Prof. Martine Hausberger & Dr Laurence Henry CNRS UMR6552, University of Rennes1, France.
- Sept. 2006 – June 2007 **Master's degree dissertation : « Social Structure of the Zebra finch (*Taeniopygia guttata*): ethological and neurobiological basis »**
Sensory and NeuroEthology Team (ENES-CNPS), National Center of Scientific Research CNRS UMR 8195, University of Saint-Etienne, France. Supervisors : Prof. Clémentine Vignal & Prof. Nicolas Mathevon.
- Fev.-Juin 2005 **1st year of Master's degree dissertation: « A new model of MASA syndrome: in vivo electroporation of mutated forms of L1 immunoglobulin-like cell adhesion molecule in the neural tube of chick embryos (*Gallus gallus*) »**
Molecular and Cellular Genetic Center (CGMC) National Center of Scientific Research UMR5534 University of Lyon, France. Supervisors : Prof. Valérie Castellani & Dr Frédéric Moret.
- July-August 2005 & June-July 2004 **Undergraduate internship : « IEG activity of the adult mouse olfactory bulb after memorizing and remembering an odor »**
Sensorial Neurosciences, Behaviour and Cognition, National Center of Scientific Research UMR5020 University of Lyon, France. Supervisors : Prof. Anne Didier & Dr Nathalie Mandairon.

TECHNICAL SKILLS

- Ethology : Behavioural monitoring, olfactory and acoustic associative learning task, social network data analysis, acoustic recordings and analysis, play-back experiments.
- Histology : Immunocytochemistry, brain fixative perfusion, cryostat sectioning, microscopy quantification, histological analysis, extra-cellular electrophysiological recordings.
- Cellular and molecular technics : Plasmid construction, in vivo electroporation in neural tube of chick embryos.
- Softwares : R (packages: Network, Seewave, lme4, nlme, car), Matlab, Goldwave, Pratt, Etholog, starting in Python.
- Computation skills: data mining, regularization techniques, generalized linear model, discriminant analysis, and development of tools to analyze neural data based on Information Theory.

COLLABORATIONS

- Kenna D.S. Lehmann, K. Holekamp Lab, Michigan State University (Vocal communication in Hyenas)
- Prof. Stephen Glickman, University of California Berkeley (Vocal communication in Hyenas)
- Prof. Clémentine Vignal ENES UMR9197, University of Saint-Etienne (Effects of hormones on zebra finch vocal behavior)
- Prof. Hédi Soula. RMND INSERM U870, INSA Lyon (Automatic detection of vocalizations; Motor model of zebra finch vocalizations).
- Prof. Martine Hausberger CNRS UMR6552, University of Rennes1 (Communication and social structure in starlings).
- Prof. Simon Griffith & Dr Mylène Mariette. Macquarie University, Sydney, Australia. (Field studies on zebra finches).
- Prof. Christopher Sturdy & Dr Marc T Avey. University of Alberta, Edmonton, Alberta, Canada (Neural processing of heterospecific and conspecific vocalizations in Chickadees)

PUBLICATIONS

14. Mouterde S, **Elie JE**, Theunissen FE, and Mathevon N. *Single neurons in the avian auditory cortex encode individual identity and propagation distance in naturally degraded communication calls*. **The Journal of Neuroscience**. Under Press.
13. **Elie JE** and Theunissen FE. *The vocal repertoire of the domesticated zebra finch: a data driven approach to decipher the information-bearing acoustic features of communication signals*. **Animal Cognition**. 2016. 19(2) 285-315 DOI 10.1007/s10071-015-0933-6 [OA eScholarship]
12. **Elie JE**, Soula HA, Trouvé C, Mathevon N and Vignal C. *Housing conditions and sacrifice protocol affect neural activity and vocal behavior in a songbird species, the Zebra finch (*Taeniopygia guttata*)*. **CR Biologies**. 2015. 338(12) 825-837
11. Perez EC, **Elie JE**, Boucaud ICA, Crouchet T, Soulage CO, Soula HA, Theunissen FE and Vignal C. *Physiological resonance between mates through calls as possible evidence of empathic processes in songbirds*. **Hormones and Behavior**. 2015. 75 130-141
10. **Elie JE** and Theunissen FE. *Meaning in the avian auditory cortex: Neural representation of communication calls*. **European Journal of Neuroscience**. 2015. 41(5) 546-567. [OA eScholarship]
9. Theunissen FE & **Elie JE**. *Neural processing of natural sounds*. **Nature Reviews Neuroscience**. 2014. 15 355-366. [OA eScholarship]
8. Mouterde S, **Elie JE**, Theunissen FE, and Mathevon N. *Learning to cope with degraded sounds: Female zebra finches can improve their expertise in discriminating between male voices at long distance*. **The Journal of Experimental Biology**. 2014. 217 3169-3177
7. Mouterde S, Theunissen FE, **Elie JE**, Vignal C and Mathevon N. *Acoustic communication and sound degradation: How do the individual signature of male and female zebra finch calls transmit over distance?* **Plos One**. 2014. DOI:10.1371/journal.pone.0102842 [OA]
6. Avey MT, Bloomfield LL, **Elie JE**, Freeberg TM, Guillette LM, Hoeschele M, Moscicki MK, Owens JL and Sturdy CB. *ZENK activation in the nidopallium of Black-capped Chickadees in response to both conspecific and heterospecific calls*. **Plos One** 2014. DOI:10.1371/journal.pone.0100927 [OA]
- P*. Theunissen FE & **Elie JE**. *Population code, noise correlations and memory*. **Neuron Previews**. 2013. 78 209-210
5. Perez EC, **Elie JE**, Soulage CO, Soula HA, Mathevon N and Vignal C. *The acoustic expression of stress in a songbird: does corticosterone drive isolation-induced modifications of zebra finch calls?* **Hormones and Behavior**. 2012. 61(4) 573-581.
4. **Elie JE**, Mathevon N and Vignal C. *Same-sex pair-bond is socially equivalent and as strong as male-female relationship in a life-long monogamous songbird*. **Behavioural Ecology and Sociobiology**. 2011. 65(12) 2197-2208
3. **Elie JE**, Soula HA, Mathevon N and Vignal C. *Dynamics of communal vocalizations in a social songbird, the zebra finch (*Taeniopygia guttata*)*. **Journal of the Acoustical Society of America**. 2011. 129(6): 4037:4046
2. **Elie JE**, Mariette MM, Soula HA, Griffith SC, Mathevon N and Vignal C. *Vocal communication at nest between mates in wild zebra finches: a private vocal duet?* **Animal Behaviour**. 2010. 80: 597-605.
1. Busto GU, **Elie JE**, Kermen F, Garcia S, Sacquet J, Jourdan F, Marcel D, Mandairon N and Didier A. *Expression of Zif268 in the granule cell layer of the adult mouse olfactory bulb is modulated by experience*. **European Journal of Neuroscience**. 2009. 29(7) 1431-1439

ORAL COMMUNICATIONS

Invited Talks

- 2016 **Ecole Normale Supérieure (ENS), Paris, France**. **Elie JE** *Meanings in Zebra finch vocalizations: an investigation of acoustic and neural codes*
- 2016 **CNRS, Gif sur Yvette, France**. **Elie JE** *Meanings in Zebra finch vocalizations: an investigation of acoustic and neural codes*
- 2016 **Queen Mary University of London, England**. **Elie JE** *Meanings in Zebra finch vocalizations: an investigation of acoustic and neural codes*
- 2015 **CN/BN colloquia, University of California Berkeley, Berkeley, CA, USA**. **Elie JE** *From sounds to meanings: What can the Zebra finch tell us about this auditory task?*
- 2014 **Max Planck Institute for Ornithology, Seewiesen, Germany**. **Elie JE**, Theunissen FE *Meaning in Zebra finches vocalizations: Acoustic Signature and Neural Representations*.

2014 Auditory Cortex Meeting, Magdeburg, Germany. Elie JE, Theunissen FE *Neural Representation of Meaning in the Avian Auditory Cortex*

2014 University of Saint-Etienne, France. Elie JE, Theunissen FE *From sounds to meaning: neural representation of Semantics.*

2013 166th Meeting of the Acoustical Society of America, special session Neural discrimination of complex sounds, San Francisco, CA, USA. Elie JE, Theunissen FE *From sounds to meaning : neural representation of calls in the avian auditory cortex*

2013 The Ear Club colloquium, University of California, Berkeley, CA, USA. Elie JE, Theunissen FE *A Neuroethological approach of vocal communication in zebra finches : from sounds to meaning.*

2013 Bay Area Birdsong Extravaganza (BABE), University of California, San Francisco, CA, USA. Elie JE, Theunissen FE *Sounds and meanings in zebra finches.*

Meetings with selection committees

2013 Neural Information Processing Scaled for Bioacoustics : NIPS4B, Lake Tahoe, NA, USA. Theunissen FE, Elie JE *Data driven approaches for identifying information bearing features in communication calls.*

2012 UC Berkeley Neuroscience Research Conference and Retreat, Tahoe City, CA, USA. Elie JE, Theunissen FE *Communication in Zebra finches : Sounds and meanings.*

2010 Conférences SFECA, Toulouse, France. Elie JE, Mathevon N, Vignal C *Male or female ? No matter what ! Same-sex pair-bond is socially equivalent to male-female relationship in a life-long monogamous songbird.*

2009 XXIII International Bioacoustic Congress, Lisbonne, Portugal. Elie JE, Soula HA, Mathevon N, Vignal C *Bird monogamy: behavioral and vocal evidences of a pressure towards social association more than reproduction.*

POSTERS

2016 CRCNS Conference, Paris, France. Elie JE, Soula H, Schachter M & Theunissen FE *Neural representations for vocal signals and vocal commands in the avian auditory cortex*

2016 International Conference of Neuroethology, Montevideo, Uruguay. Elie JE, Theunissen FE. *Encoding models reveal how and when the meaning of communication calls is extracted by the avian auditory cortex*

2014 Auditory Cortex Meeting, Magdeburg, Germany. Elie JE, Theunissen FE. *Encoding models reveal how and when the meaning of communication calls is extracted by the avian auditory cortex.*

2014 Gordon Research Conference on Auditory System, Bates College, Lewiston, ME, USA. Elie JE, Theunissen FE. *Encoding models reveal how and when the meaning of communication calls is extracted by the avian auditory cortex.*

2014 Computational and systems neuroscience: COSYNE, Salt Lake City, UT, USA. Elie JE, Theunissen FE. *From sounds to meaning: neural representation of calls in the avian auditory cortex.*

2013 Neural Information Processing Scaled for Bioacoustics: NIPS4B, Lake Tahoe, NA, USA. Elie JE, Theunissen FE. *Data driven approaches for identifying information bearing features in communication calls.*

2013 Songbird Satellite Meeting : Mechanisms of Communication 3, La Jolla, CA, USA. Elie JE, Theunissen FE *From sounds to meaning : neural representation of calls in the avian auditory cortex.*

2013 Annual meeting of the Society for Neuroscience (SFN), San Diego, CA, USA. Elie JE, Theunissen FE *From sounds to meaning : neural representation of calls in the avian auditory cortex.*

2013 Annual meeting of the Society for Neuroscience (SFN), San Diego, CA, USA. Carney MR, Elie JE, Minton Y, Theunissen FE *Social learning in Zebra Finches : learning a conditioning task by example.*

2012 Annual meeting of the Society for Neuroscience (SFN), La Nouvelle Orléans, NO, USA. Elie JE, Theunissen FE *How do Zebra finches perceive the information content of vocalizations ?*

2012 10th International Congress of Neuroethology, University of Maryland, College Park, MD, USA. Elie JE, Theunissen FE *Auditory processing of social cues in a songbird, the Zebra finch.*

2011 Janelia Conference « Producing and perceiving complex acoustic signals : songbirds and mice as model systems », HHMI Janelia Farm Research Campus, Virginia, USA. Elie JE, Soula HA, Mathevon N, Vignal C *To which extent is the sound resulting from a vocal network influenced by group composition in Zebra finches?*

2010 9th International Congress of Neuroethology, Salamanca, Spain. Elie JE, Soula HA, Trouvé C, Mathevon N, Vignal C *Housing conditions affect neural activity within the social behavior network in zebra finches.*

2009 5th Ecology and Behaviour Meeting, Lyon, France. Elie JE, Vignal C, Soula H, Mathevon N *Vocal dynamic in zebra finches' groups: Does pair-bonding change the way birds call?*

2008 Second International Conference on Acoustic Communication by Animals, Oregon State University and the Acoustical Society of America (ASA), Corvallis, Oregon, USA. Elie J, Vignal C, Soula H, Mathevon N *Vocal dynamic in zebra finches' groups: Does pair-bonding change the way birds call?*

2008 4th European Conference on Behavioural Biology, Dijon, France. Elie J, Vignal C, Mathevon N *Pair-bonding in zebra finches : Do males care more than females?*

2007 XXII International Bioacoustic Congress, Pavia, Italia. Elie J, Vignal C, Mathevon N *Same-sex pair-bonds in zebra finches.*

My research activities were broadcasted by local, national and international press (La Tribune/Le Progrès, BBC Nature, California magazine, The Daily Californian, The Berkeleyan...) and on radio channels (BBC Radio 5Live, The Swedish Radio).

PEER-REVIEWING ACTIVITY

Reviewer for the following journals: *Frontiers in Behavioural Neuroscience*, *Frontiers in Psychology*, *Behavioral Ecology*, *Animal Cognition*, *Animal Behaviour*, *Ethology*.

Verified peer review record on Publons: <https://publons.com/a/745489>

STUDENTS SUPERVISION

Sept 2016 – 2017: Malit B. « *The categorization of meanings in zebra finches* ». URAP student, University of California Berkeley. (co-supervised with F. Theunissen, University of California Berkeley).

Sept 2014 – 2016: Amin M.D. « *Perception and categorization of vocalizations in zebra finches* ». URAP student, University of California Berkeley. (co-supervised with F. Theunissen, University of California Berkeley).

April 2013 – Sept 2014: Amin M.D. « *3D reconstruction of the avian auditory system* ». URAP student, University of California Berkeley. (co-supervised with F. Theunissen, University of California Berkeley).

Jan. 2013 – June 2014: Carney M.R. « *Social learning of an auditory task in the zebra finch* ». Honor thesis student, University of California Berkeley. (co-supervised with F. Theunissen, University of California Berkeley).

Sept. 2012 – January 2013: Carney M.R. « *Voice discrimination in the zebra finch* ». URAP student, University of California Berkeley. (co-supervised with F. Theunissen, University of California Berkeley).

May 2012 - Aug. 2012: Carney M.R. « *Effects of Arginine Vasotocin in the Secondary Auditory Areas of the Zebra Finch* ». Graduate student, University of California Berkeley. (co-supervised with F. Theunissen, University of California Berkeley). Summer Undergraduate Research Fellow from the Rose Hills Foundation (\$6.000). Poster presentation at SURF conference, UCB: *Voice discrimination in the zebra finch*.

Nov. 2011 - Jan. 2012: Day T. « *Individual recognition in zebra finches irrespective of the type of call used* ». Graduate student, University of California Berkeley. (co-supervised with F. Theunissen, University of California Berkeley).

Sept. 2011 - April 2012: Carney M.R. « *Effect of vasotocin on social cues perception in zebra finches* ». Undergraduate student, University of California Berkeley. (co-supervised with F. Theunissen, University of California Berkeley).

Feb. 2009 - June 2009: Navarre A. « *Acoustic perception of the pair-bonding status in zebra finches* ». Undergraduate student, University of Strasbourg, France. (co-supervised with C. Vignal, University of Saint-Etienne, France).

Sept 2008 - June 2009: Perez E. « *Social links disruption and acoustic expression of stress in zebra finches* ». Graduate student, 2nd year Master degree dissertation, University of Saint-Etienne, France (co-supervised with C. Vignal, University of Saint-Etienne, France).

TEACHING EXPERIENCE (2007-2010)

Practical work “reasoning in neuroethology research” (Undergraduate and graduate levels):

Through journal articles and fresh results of the lab, I presented how researchers reason in neuroethology and made undergrad students find their own experiment on a specific question.

Practical work on genetics (Undergraduate and graduate levels):

I trained undergrad students on exercises of Mendelian genetic and master students on exercises of formal and molecular genetics.

Lab work on human physiology (Undergraduate level):

I investigated respiratory, circulatory, digestive and excretory functions through dissections, experiments, observations and exercises with undergrad students.

Lab work on developmental biology (Undergraduate level):

I investigated frog (*Xenopus laevis*) and sea urchin developments through in vitro fertilization and observations of living embryos, and arthropods metamorphosis through experiment of tying on *Galleria mellonella* with undergrad students.

Lecture on brain development (Undergraduate level):

I investigated the main phenomena of mammal brain development with undergrad students from fertilization to birth (neurogenesis, neuron migration, genetic factors, external factors, brain development impairments) and particularly insisted on parameters influencing the brain throughout life (experience, memory, learning, long term potentiation).

Scientific popularization (may 2008): I introduced life sciences to different classes of elementary school children through the example of dinosaurs' extinction.