

# Yseult Héjja-Brichard

Centre d'Ecologie Fonctionnelle et Evolutive - CNRS - UMR 5175  
Campus du CNRS - 1919 route de Mende - 34293 Montpellier Cedex 05 - France  
E-mail: [yseult.hejja@cefe.cnrs.fr](mailto:yseult.hejja@cefe.cnrs.fr) - Website: [yseulthb.github.io](https://yseulthb.github.io)

## RESEARCH PROFILE

---

My research program centres on investigating **how sensory and cognitive systems evolve and are shaped by environmental characteristics**, with a particular interest in how animals perceive and respond to visual stimuli. I use a **combination of behavioural experiments, computer vision tools, and machine learning algorithms** to address these questions in various species. In addition to this line of research, I am also interested in developing computational models to understand decision-making and the cognitive factors behind it. This work has the potential to reveal **new insights into the evolutionary dynamics of animal communication and signalling**, which are critical for species conservation and the assessment of human impacts on wildlife.

## ACADEMIC POSITION

---

**Centre d'Ecologie Fonctionnelle et Evolutive**

*Postdoctoral researcher*

**Montpellier, France**

*December 2023 - Present*

**UMBC Biological Sciences**

*Postdoctoral researcher*

*Visiting postdoctoral researcher*

**Baltimore, MD, USA**

*November 2021 - November 2023*

*March 2024 - May 2024*

**Centre d'Ecologie Fonctionnelle et Evolutive**

*Postdoctoral researcher*

**Montpellier, France**

*November 2020 - October 2021*

How information theory can inform the evolution of sexual signalling patterns in darters (*Etheostoma* spp.)

Collaboration between France and the US. *Behavioral experiments, image analysis, deep learning.*

Postdoctoral advisors: Tamra C. Mendelson (UMBC) and Julien P. Renoult (CEFE, CNRS).

## EDUCATION

---

**PhD studies in Neuroscience, Cognition, and Behaviour**

**2020**

*Université Paul Sabatier and CerCo (CNRS), Toulouse, France*

Supervisor: Benoit R. Cottureau, within the Eco-3D team.

Title of the thesis: Spatial and temporal integration of binocular disparities in primates.

*Functional neuroimaging, visual behaviour, comparative visual cognition (macaques and humans)*

**Msc in Neuroscience, Cognition, and Behaviour (2nd year)**

**2015**

*Université Paul Sabatier, Toulouse, France*

Research internship at CerCo, Toulouse. Supervised by Benoit R. Cottureau & Jean-Baptiste Durand.

Research project: Cortical networks involved in 3D orientation processing in primates.

**Msc in Cognitive and Social Psychology (1st year)**

**2014**

*Université de Grenoble-Alpes, Grenoble, France*

Research internship at the LPNC, Grenoble. Supervised by Olivier Pascalis.

Research project: Role of the eyes in a face categorisation task.

Clinical internship in Neuropsychology at the Hospital of Grenoble. Supervised by Eugénie Lhommée.

Université de Grenoble-Alpes, France & Universität Leipzig, Germany

Research assistant at the Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany  
Department of social neuroscience (April-July 2013). Supervised by Natacha Mendes.

*In charge of coding chimpanzees' vocalisations collected for an experiment investigating Schadenfreude.*

## TEACHING EXPERIENCE

---

### Temporary teaching assistant (2019-2020) for Bsc Psychology students (1<sup>st</sup> year) - 48 hrs

Department of Psychology, Université Toulouse Jean Jaurès, Toulouse, France.

Tutorial classes: *Introduction to Psychophysiology*

Responsibilities: Re-designed and delivered weekly tutorial classes to groups of 40 students on the topics of Ontogenesis, Hormones in the human body, and Introduction to Genetics.

### Graduate teaching assistant (2015-2018) for Bsc Biology students (2<sup>nd</sup> and 3<sup>rd</sup> years) - 193 hrs

Department of Neuroscience and Behavioural Science, Université Paul Sabatier, Toulouse, France.

Practical works and tutorial classes: *Neural and brain functions, Behavioural ecology, Neurophysiology, Neuroscience*

Responsibilities: Designed and delivered the content of two seminars to groups of 40 students; trained two new graduate teaching assistants; assessed students' reports and final exams; implemented new assessment methods. Trained groups of 20 students on experimental designs, research methodology, and statistical analyses during weekly three-hour lab sessions.

## SCIENTIFIC PRODUCTION

---

### Publications

#### *Under review or in preparation*

- o **Héjja-Brichard, Y.**, Renoult, J.P., Mendelson, T.C. (*in revision*). Comparative analysis reveals assortative mating preferences in darters independent of sympatry and sex. [Preprint]
- o **Héjja-Brichard, Y.**, Million, K., Renoult, J.P., Mendelson, T.C. (*in revision*). Using Neural Style Transfer to study the evolution of animal signal design: A case study in an ornamented fish. [Preprint]
- o **Héjja-Brichard, Y.**, Raymond, M., Cuthill, I., Mendelson, T.C., Renoult, J.P. (*submitted*). Perceptual biases, camouflage patterns, and the origin of sexual signals. [Preprint]
- o ManyManys et al. (including **Héjja-Brichard, Y.**)(*in prep*). Reversal learning across taxa - finding procedures and methods for common measurements.
- o Renous Y., **Héjja-Brichard, Y.**, Million, K., Mendelson, T.C., Renoult, J.P. (*in prep*). Testing for a pre-existing preference for habitat-mimicking patterns in the sexual signals of *Etheosoma olmstedii*.

#### *Peer-reviewed journal articles*

- o ManyPrimates et al. (including **Héjja-Brichard, Y.**) (2022). The evolution of primate short-term memory. *Animal Behavior and Cognition*. <https://doi.org/10.26451/abc.09.04.06.2022> [Preprint]
- o Guiomar, N., Krol, L.R., Combrisson, E., Dubarry, A.-S., Elliott, M.A., François, C., **Héjja-Brichard, Y.**, ... Chaumon, M. (2022). Good Scientific Practice in MEEG research: Progress and Perspectives. *Neuroimage*. <https://doi.org/10.1016/j.neuroimage.2022.119056>. [Preprint]
- o Audurier, P., **Héjja-Brichard, Y.**, De Castro, V., Kohler, P.J., Norcia, A.M., Durand, J.-B., Cottureau, B.R. (2021). Symmetry processing in the macaque visual cortex. *Cerebral Cortex*. <https://doi.org/10.1093/cercor/bhab358>. [Preprint]
- o De Castro, V., Smith, A.T., Beer, A.L., Leguen, C., Vayssière, N., **Héjja-Brichard, Y.**, Audurier, P.,

- Cottureau, B.R. & Durand, J.B. (2021). Connectivity of the cingulate sulcus visual area (CSv) in macaque monkeys. *Cerebral Cortex*. <https://doi.org/10.1093/cercor/bhaa301>
- o **Héjja-Brichard, Y.**, Rima, S., Rapha, E., Durand, J.-B. & Cottureau, B.R. (2020). Stereomotion processing in the non-human primate brain. *Cerebral Cortex*, 30(8), 4528-4543. <https://doi.org/10.1093/cercor/bhaa055>. [Preprint & OSF project]
  - o Rima, S., Cottureau, B.R., **Héjja-Brichard, Y.**, Trotter, Y. & Durand, J.B. (2020). A new visuotopic cluster in macaque posterior parietal cortex revealed by wide-field retinotopy. *Brain Structure and Function*. <https://doi.org/10.1007/s00429-020-02134-2>
  - o Chauhan, T., **Héjja-Brichard, Y.**, & Cottureau, B.R. (2020). Modelling binocular disparity processing from statistics in natural scenes. *Vision Research*, 176. <https://doi.org/10.1016/j.visres.2020.07.009>
  - o Cottureau, B.R., Smith, A.T., Rima, S., Fize, D., **Héjja-Brichard, Y.**, Renaud, L., ... & Durand, J.-B. (2017). Processing of Egomotion-Consistent Optic Flow in the Rhesus Macaque Cortex. *Cerebral Cortex*, 27(1), 330–343. <https://doi.org/10.1093/cercor/bhw412>

## Presentations

### Invited talks

- o **Héjja-Brichard, Y.** (2024) Neural style transfer and perceptual distance to test pattern preferences in fish. AI for ecology and evolution seminar, University of Montpellier, France.
- o **Héjja-Brichard, Y.** (2023) Computational approaches to understanding the evolution of sexual signal design. Department of Biology, University of Pennsylvania, USA.
- o **Héjja-Brichard, Y.** (2022) AI methods to study sexual selection. Imagineecology2: machine learning for image and sound processing and analysis in ecology, Villeurbanne, France.
- o **Héjja-Brichard, Y.** (2020). Rethinking our Narratives: The Challenge of Slow Science. LiveMEEG.
- o **Héjja-Brichard, Y.** & Mercier M.R. (2018). Data visualisation in cognitive neuroscience: Functional neuroimaging and electrophysiology. Toulouse Data Visualization group, Toulouse, France.
- o **Héjja-Brichard, Y.** (2018). Open Science: Why and How? CerCo's Young Scientist Meeting, Toulouse.

### Conference talks

- o Million, K., **Héjja-Brichard, Y.**, Nasir M., Tucker, S., Mendelson, T.C. (2023). Territorial competition and mate choice in the rainbow darter (*Etheostoma caeruleum*). Southeastern Fishes Council 2023 meeting, Chattanooga, TN, USA.
- o **Héjja-Brichard, Y.**, Million, K., Renoult, J.P., Mendelson, T.C. (2023). Using generative artificial intelligence to test hypotheses about animal signal evolution in an ornamented fish. Evolution 2023 meeting, Albuquerque, NM, USA.
- o ManyFishes (incl. **Héjja-Brichard, Y.**) Using the detour task to assess inhibitory control across the fish taxon. 30th Annual International Conference on Comparative Cognition, Melbourne Beach, FL, USA.
- o Renoult, J.P. & **Héjja-Brichard, Y.** (2022) Using deep neural networks to study the evolution of visual signals. International Conference on Ecological Sciences, SFE2-GfÖ-EEF joint meeting, Metz, France.
- o **Héjja-Brichard, Y.** (2021). Workshop on Research Culture based on the Café Culture Kit developed by the Wellcome Foundation. Conférence Science Ouverte Lente Durable, Nantes, France.
- o Audurier, P., **Héjja-Brichard, Y.**, Kohler, P.J., Norcia, A.M., Durand, J.-B., Cottureau, B.R. (2019). Processing of rotational symmetry in the non-human primate brain. Annual meeting of the French research group 'GDR Vision', Marseille, France.

### Conference posters

- o **Héjja-Brichard, Y.**, Raymond, M., Cuthill, I.C., Mendelson, T.C., Renoult, J.P. (2023, Nov.). Visual

pattern preferences: Testing the processing bias hypothesis with background-matching stimuli to shed light on signal design evolution. Society for Neuroscience, Washington, DC.

- o **Héjja-Brichard, Y.**, Renoult, J.P., Mendelson, T.C. (2022, July). Strength of preference for conspecifics in Darters (genus *Etheostoma*): A meta-analysis. Animal Behavior Society, San José, Costa Rica.
- o Audurier, P., **Héjja-Brichard, Y.**, Kohler, P.J., Norcia, A.M., Durand, J.-B., Cottureau, B.R. (2019, Oct.). Processing of symmetry in the non-human primate brain. Society for Neuroscience, Chicago, IL.
- o De Castro, V., LeGuen, C., **Héjja-Brichard, Y.**, Audurier, P., Cottureau, B.R., Durand, J.-B. (2019, Oct.). Functional and structural connectivity of the cingulate sulcus visual (CSv) area in macaque monkeys. Society for Neuroscience, Chicago, IL.
- o **Héjja-Brichard, Y.**, Bruzzone, S.E.P., Rapha, E., Durand, J.-B., Cottureau, B.R. (2019, Sept.). Influence of natural statistics on depth perception. Predictive Brain Conference, Marseille, France.
- o **Héjja-Brichard, Y.**, Rima, S., Rapha, E., Durand, J.-B., Cottureau, B.R. (2018, Nov.). Stereomotion processing in the non-human primate brain. Society for Neuroscience, San Diego, CA.
- o Rima, S., Cottureau, B.R., **Héjja-Brichard, Y.**, Trotter, Y., Durand, J.-B. (2017, Nov.). Wide-field retinotopy reveals a new visuotopic cluster in IPS. Society for Neuroscience, Washington DC.
- o **Héjja-Brichard, Y.**, Rima, S., Durand, J.-B., Cottureau, B.R. (2017, Aug.). Stereomotion processing in the non-human primate brain. European Conference on Visual Perception, Berlin, Germany.
- o **Héjja-Brichard, Y.**, Rima, S., Trotter, Y., Banks, M.S., Durand, J.-B., Cottureau, B.R. (2015, Oct.). Adaptation to the 3D properties of the environment in non-human primates. GDR Vision annual forum, Grenoble, France.

### ***Open Science workshops***

- o Beffara, B., Bret, A., Nalborczyk, L., **Héjja-Brichard, Y.**, & Beffara, B. (2020, February). A practical introduction to the Open Science Framework. CRNL Workshop on Open Science, Lyon, France.
- o Beffara, B., Nalborczyk, L., **Héjja-Brichard, Y.**, & Bret, A. (2017, November). Open, slow, and sustainable science. PhD student Day of the LPNC lab, Grenoble, France.

### ***Lab and departmental seminars***

- o Computational approaches to understanding the evolution of sexual signal design (2023). Department of Biological Sciences, UMBC, Baltimore, MD, USA.
- o Visual Pattern Preferences (2023). Mendelson Lab Meeting, UMBC, Baltimore, MD, USA.
- o Deep Learning et al. Architecture and Applications in Biology (2022). Mendelson Lab Meeting, UMBC.
- o Investigating natural statistics and sexual signalling patterns with deep learning (2021). Department of Evolutionary and Behavioural Ecology meeting, CEFÉ, Montpellier, France.
- o Open Science practices in Eco/Evo (2021). E3CO team seminar, CEFÉ, Montpellier, France.
- o Stereovision processing in primates: A neuroimaging and psychophysics investigation (2021). E3CO team seminar, CEFÉ, Montpellier, France.
- o Democracy in the animal kingdom: Collaborative decision-making (2019). CerCo Winter School, Pragnères, France.
- o Stereovision in the animal kingdom: Which species, at what cost, and for which advantages? (2018) CerCo Lab Day, Muret, France.
- o Sexism in research and at the university: Why should it matter? What can we do about it? (2018) CerCo Winter School, Piau-Engaly, France.

## STUDENT SUPERVISION & MENTORING

---

- o Nishtha Pareek\*, Master's student in Biology and Electronics Engineering, Birla Institute of Technology and Science, Pilani, India, 2024
- o Sarah Clement\*, Master's student in Ecology and Evolution, University of Rennes, France, 2024
- o Maxine Akunnakwe\*<sup>+</sup>, Undergraduate student in Biological Sciences, UMBC, US, 2024
- o Gabby Dennis\*<sup>+</sup>, Undergraduate student in Biological Sciences, UMBC, US, 2023, 2024
- o Jessie Gordon\*, Undergraduate student in Biological Sciences, UMBC, US, 2023
- o Jonah E. Brenner, Master's student in Ecology & Evolution, University of St Andrews, UK, 2023
- o Yoni Renous, Master's student in Evolutionary Biology (MEME), University of Montpellier, France, 2023
- o Katherine Taylor<sup>+</sup>, Undergraduate student in Biological Sciences, UMBC, US, 2022, 2023
- o Sierra Barber<sup>+</sup>, Undergraduate student in Biological Sciences, UMBC, US, 2022
- o Kossi Katchekpele\*, Undergraduate student in Biological Sciences, UMBC, US, 2022
- o Lauren Norwood\*, Undergraduate student in Biological Sciences, UMBC, US, 2022
- o Alexandre Durrmeyer, Master's student, School of Engineering - Signal Processing, Paris, France, 2021
- o Pauline Audurier, PhD student in Neuroscience, University of Toulouse, France, 2019
- o Silvia E.P. Bruzzone\*, Master's student in Neuroscience, University of Trieste, Italy, 2019
- o Guillaume Thuéry\*, Master's student in Neuroscience, University of Bordeaux, France, 2018

\* Direct supervision; <sup>+</sup> Undergraduate research award recipient

## GRANTS & FELLOWSHIPS

---

- o 2023: Travel grant to attend the COSYNE 2023 conference in Montréal, QC, Canada
- o 2022: Travel grant to attend the Brains Minds & Machines summer course in Woods Hole, MA, USA
- o 2022: Travel award to attend the annual conference of the Animal Behavior Society in Costa Rica
- o 2021: Funding to organise a conference on open and sustainable science, LPPL and PROGEDO Loire
- o 2020: Three-month extension to finalise my doctoral thesis, Internal funding, CerCo - CNRS
- o 2015: Three-year doctoral fellowship to pursue a PhD, University of Toulouse, France (2015–2018)
- o 2012: Erasmus grants from the European Union and from the French Rhône-Alpes region

## PROFESSIONAL AFFILIATIONS

---

- o Association for Women in Science (2023 - present)
- o Animal Behavior Society (2022 - present)
- o Comparative Cognition Society (2022 - present)
- o Society for Open, Reliable, and Transparent Ecology and Evolutionary Biology (2021 - present)
- o National Postdoctoral Association (2021 - present)
- o Association for the Study of Animal Behaviour (2020 - present)
- o Big Team Science: ManyPrimates; ManyFishes (founding team member); ManyManys

## SERVICE AND OUTREACH

---

### Lab & Community Involvement

- o Co-organisation of a conference to promote open and sustainable scientific practices for the French-speaking community: [SOLD21](#) (July 2021)
- o Ambassador for the Center for Open Science: [COS](#) (2018-present)
- o Co-creation of a Welcome Kit for new students and postdocs (2019)
- o Organisation of the Lab Student Day (2019) and the Lab Winter School (2017, 2018)
- o Student representative at the Lab Council (2017-2018)

## Reviewing activity

- Scientific journals: *Behavioral Ecology*, *Trends in Ecology and Evolution*, *NeuroImage*, *Symmetry*
- Research grants: *National Science Foundation (Behavioral Systems Cluster)*, *The Animal Behavior Society Student Research Grants*
- Editorial activity: *Moderator for the EcoEvoRxiv preprint server*

## Personal Implication in Science Popularisation

- Scientific speed dating with groups of high school students (December 2023) with the [Declics](#) association.
- Outreach project at UMBC (Spring and Fall 2023) to share our research on sexual selection in darters with undergraduate and high school students.
- Editor of the second issue of the magazine "[Perspectives](#)" for [FRESCO](#), a French national organisation involved in popularising cognitive science.
- Coordination of a thematic issue on Altruism in animals for the magazine "[Perspectives](#)" (Spring 2022).
- Moderator of a discussion on slow science and research outside academia (March 2021), [WEPASCO](#)
- Public presentation on visual illusions (March 2019) for the Brain Awareness Week in Toulouse, FR.
- Public presentation on the study of 3D vision in animals (February 2017), Museum de Toulouse, FR.
- Article for the Museum of Natural History in Toulouse (2017, in French) about the evolution of 3D vision in animals: Y. Héjja-Brichard & B.R. Cottureau "[Evolution et vision : le vivant a de la profondeur!](#)"

## RESEARCH SKILLS

---

### Computer skills

- Programming: Matlab, R, Python (NumPy, PyTorch)
- Neuroimaging: SPM12, caret5 (software for monkey data), PRoNTo (Pattern recognition toolbox)
- Stimulus presentation: EventIDE, jsPsych, PsychToolbox
- Writing: LaTeX, RMarkdown, Office
- Graphics editor: Adobe Illustrator, Photoshop, GIMP
- Data and article sharing: Github, Open Science Framework, bioRxiv, EcoEvoRXiv
- Web development: HTML, CSS, JavaScript
- Version control: Git, Github, Gitlab
- Animal behaviour: BORIS, DeepEthogram, ImageJ
- Other tools: MEGA software (phylogenetic data), LimeSurvey (survey tool), Blender (video animation)

### Data analysis

- Functional neuroimaging data (univariate, retinotopic, and multivariate pattern analyses)
- Psychophysical and behavioural data modelling
- Image analysis (pattern recognition, signal processing)
- Eye-tracking analyses

### Complementary Skills and Training

- **Languages** – French (native), English (full proficiency), German (good command in speaking, level B2), Spanish (basic communication skills, level B1), Italian (basic understanding, level A2).
- **Teaching training** – Pedagogical toolbox (3-day on evidence-based teaching practices); Teaching in the digital era: Thinking about your teaching differently; Teaching practice in a foreign language; Understanding what it means to learn in order to teach more effectively (University of Toulouse)
- **Methodological improvement**
  - Tutorials in statistical analyses: frequentist and Bayesian frameworks
  - Workshops in ethics: Primate Welfare Meetings; "Research in Biology and societal considerations"

by a graduate school; Ethics and scientific integrity

- Workshop on Artificial Intelligence: 'Tracing the links between Cognition, Consciousness, and AI' by CIFAR; Tutorial on Reinforcement Learning at COSYNE 2023.

o **Summer Schools**

- [Neuromatch Academy: Deep Learning](#) (August 2021). Group project: "Assessing the robustness against word permutations of CNNs and LSTMs in semantic similarity learning."

- [Center for Brains, Minds & Machines \(MIT\)](#): Summer school on the problem of intelligence (Woods Hole, MA, August 2022). Personal project on multi-agent reinforcement learning.

- [Oxford Machine Learning Summer School](#) (May-July 2023, 4-day monthly sessions). Advanced topics and developments in machine learning and deep learning.

o **Certifications**

- Experimental research design in non-human primates - June 2016 (CNRS Marseille, France)

- Lab training: Introduction to Biosafety, Animal Biosafety, Hazard Communication, Wildlife Research, Training for Investigators, Staff and Students Handling Biohazards - November 2021, 2022 (CITI program, UMBC)