Marie-Geneviève Guiraud (born 19/11/1990)

Marie Curie post-doctoral fellow – ISM, Aix-Marseille University

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Resume

My research operates at the interface of cognitive neuroscience, experimental psychology, and bio-inspired science. I investigate the neural and behavioural mechanisms underlying visual cognition using insects as model systems. By integrating behavioural experiments, computational modelling, and quantitative analysis, my work aims to uncover efficient sensory strategies that inform both fundamental neuroscience and the development of autonomous artificial systems.

Education

PhD in Biological Sciences mention Experimental Psychology
2015 – 2019 Department of Experimental Psychology, University Queen Mary of London, United Kingdom
Advisor: Prof. Lars Chittka ; Jury: Barbara Webb & Elisabetta Versace.

Master 2 Neurosciences and Signalling
2013 – 2014 University Paris 11, France
Advisors: Prof. Martin Giurfa and Dr. Maria-Gabriela de Brito Sanchez

Master 1 Neurosciences, Behaviour and Cognition
2012 – 2013 University Toulouse III Paul Sabatier, France
Advisors: Prof. Martin Giurfa, Prof. Walter Farina and Dr. Maria-Gabriela de Brito Sanchez

Magistere of Neurosciences (semester 1)
2011 – 2012 University Valparaiso, Chile

Bachelor's degree in biology of Organisms, Populations and Ecosystems
2008-2011 University Toulouse III Paul Sabatier, France

Professional Experience

Post-doctoral fellow
Aix-Marseille University, Institut des Sciences et du Mouvement, Biorobotics
2026 (Jan) – 2028 (Jun); Supervisor Prof. Julien Serres
Projects: [1]Development of a bio-inspired optical compass based on sky polarization for autonomous robot navigation, with photodetector array optimization using simulation (OpenSky), project ECOPOL (ANR, AID, SOLNIL); [2]**Marie Curie Individual Fellowship** Integration of 3D objects by the bee brain – from behaviour to the brain.
Techniques: Behavioural experiment, computational neurosciences, systems, modelling, etc.
Conferences organisation: NIBAI second edition (Sept 2026) sponsored by the Royal Society.

Post-doctoral fellow
Macquarie University, Biology department, Prof. Barron's laboratory
2022 (Nov) – 2025 (Nov); Supervisor Prof. Andrew Barron
Projects: [1]Active vision in bees (with Nordstrom K., MaBouDi H.), [2]Short-term memory assay (STM) in comparative cognition (bees, birds, dogs & dolphins; with Hare B.), [3]Geometric module (with Duval A.), [4]Native bee neuron counting.
Techniques: Neuroscience (isotropic fractionator), free-flying experiments (bees & hummingbirds), modelling, video analysis.
Conferences organisation: 7+ conferences through Macquarie Minds and Intelligence Initiative (2023-2025; Australia), 1 ARCANI conference (26-28/03/24, Sydney, Australia), 1

A.S.A.B Interdisciplinary Workshop NIBAI 2025 (4-5 sept) Nature of Intelligence, Bridging Animal and Artificial Intelligence, Sheffield, UK.
Outreach projects: Artist-in-residence supervision https://www.kategorringesmith.com.au, 2 editions of Bee Days workshops (each July 2023-2025), on-campus Pollinators workshop (04/25).
Administrative duties: grant writing and financial management, lab schedules and orders, safety protocols, outreach programs management, onboarding of new members.

Biology teacher
Collège Victor Hugo, Lavelanet, France
2022 (March - July)
Teaching: Biology, Geology and more for 11-15 y/o. Creation of course materials, games (Immunity-based Role Play game, Prisonner's dilemma), creative projects, Q&A sessions. Microscope observations & dissections.
Outreach projects: Science club, botanic, Psychology 101 classes on consent, non-violent communication and personal growth.
Administrative duties: student management, health & wellbeing, EDI courses, pastoral care of students, curriculum management and modification (etc.), teaching-related management.

Post-doctoral fellow and laboratory manager
Stockholm University, Sweden, Zoology department, INSECT laboratory
2019 (Oct) - 2021 (Nov); Supervisor Prof. Emily Baird
Project: Impact of climate change on pollinators' behaviour, brain & anatomy.
Techniques: Morphometrics, anatomy, micro-CT, AMIRA 3D reconstruction of eyes/brains, behavioural (P.E.R., foraging, tunnel) and sensory experiments (including respirometer).
Teaching: psychophysics (30+ h).
Citizen science project: from design to development Pollinators Of Sweden (P.O.S) https://www.invismo-project.com/outreach and delivery of political briefs for the Ministry of Climate and Enterprise.
Administrative duties: setting new laboratory, websites design, laboratory organisation, grant writing and financial management, schedules and orders, writing safety protocols, outreach programs management, onboarding of new members, management of external stakeholders and politics.

PhD student
University Queen Mary of London, United Kingdom, Bee Sensory and Behavioural Ecology Laboratory
2015 (Sept) – 2019 (Sept); PhD awarded on 31 May 2020. Supervisor Prof. Lars Chittka
Project: Active vision and pattern recognition in bees.
Techniques: Behavioural tests (bees and humans – eye-tracking), software programming, 2D/3D tracking, video tracking and analysis.
Teaching: 350+ hours in experimental psychology, research methods, neuro-psychology, statistics, project management, molecular and cellular biology, evolution, practical biology, ecology, behavioural ecology, neurosciences, animal behaviour (and more).
Citizen science project: Save the London Bees (2 editions), Open door lab (twice a year for 4 years), school outreach for 12 to 15 y/o (1 each year, with teacher P. Falba, Montauban schools).
Administrative duties: grant writing and financial management, lab schedules and orders, safety protocols, outreach programs management, onboarding of new members.

C.N.R.S. Research engineer and internships (2 years)
Research Centre on Animal Cognition, University Toulouse III Paul Sabatier, France
2012-2015; Supervisors Prof. Martin Giurfa, Prof. Walter Farina
Projects: [1]Aversive taste conditioning in the honeybee: neuronal mechanisms and pathways; [2]Role of Neuropeptide F in the Ingestion of harmful substances in the domestic honeybee;

[3]Influence of insulin injections on olfactory and gustatory sensitivity during development in *Apis mellifera*.
Techniques: Micro-injections (biogenic amines, blockers, RNAi), brain dissections and extractions, optical, Nanodrop use, qPCR, behavioural tests (olfactory and gustatory), statistical analysis, beekeeping.
Administrative duties: onboarding of new members, safety protocols.

Laboratory technician and magister student
Centro Interdisciplinario de Neurociencias de Valparaiso – University of Valparaiso, Chili
2011-2012; Supervisor Prof. Kathleen Whitlock
Projects: Study of adult neurogenesis in the olfactory circuits of honeybee queens.
Techniques: Bibliography, protocol design, technics in molecular and cellular biology, microscopy, image and results processing, statistics.

Scientific and cultural guide
Museum of Natural History of Toulouse, France
2010-2011
Teaching: science popularisation, live demonstrations, scientific and game workshops, exhibition visits, peer training.

Private teacher
Toulouse, France
2009-2010
Teaching: mathematics, biology, physics, chemistry, English, Spanish, French for students between 11-17 y/o.

Supervision

Nuffield students (17-18 y/o)
2016-2017 Stella Jones
2016-2017 Zilan Ersoy
2016-2017 Georgia Curtis
2016-2017 Aqsa Ahmad
2016-2017 Dilem Cantay

MSc students
2016-2017 Samadi H. Galapayage*
2017-2018 Olivia K. Bates (co-author)
2017-2018 Theotime Marcenac
2019-2020 Zanna Johansen (co-author)
2020-2021 Berenice Cariou (co-author)
2020-2021 Maxime Henrion (co-author)
2020-2021 Anahit Amiri
2023-2024 Rodrigo M. Cadenas*

Laboratory technicians
2020-2021 Ernesto Restrepo (co-author)

Undergraduate students
2016-2017 Tudor C. Aniculaesei (co-author)
2017-2018 Emily Quinsal-Keel (co-author)
2024 Oatile Pilate

PhD students (co-supervision)
2017-2019 Samadi H. Galapayage*
2017-2019 J. Eric Romero Gonzales*
2017-2019 Alice D. Bridges*
2017-2019 Joanna Brebner (working on a podcast together)*
2019-2021 Zahra Moradinour (co-author)
2019-2021 Vun Wen Jie (co-author)
2024-2025 Rodrigo M. Cadenas (future co-author)*
2022-2025 Casey Forster*
2022-2025 Faelan Mourmourakis*
2022-2026 Jeanne Godard* (future co-author)
2024-2026 Janie Fink*

Note that I supervised numerous students, most of whom I trained in bee handling, experimental and analytical techniques. This supervision did not always result in co-authored publications, as several students pursued independent PhD projects, some of their contributions did not meet authorship criteria, or I chose not to request acknowledgment despite substantial involvement.*

Awards, Fellowships & Grants

2026 E.R.C Starting grant – will apply with ISM, Marseille
2025 A.T.I.P – applied with ISM, Marseille

2025 Marie Curie individual fellowship M.S.C.A – awarded with 99% 225000 €
2023 Macquarie Minds and Intelligence initiative travel & equipment grant **5000$ AU**
2021 Marie Curie M.S.C.A. – Unawarded but Seal of excellence 93%
2021 Diamond Light Source - How does the bee eyes adapt to its visual environment? **23000** €
2019 Diamond Light Source - Bigger is better for bumblebee eyes. **22000** €
2019 QMUL equipment grants 5000 €
2018 A.S.A.B. (Association for the Study of Animal Behaviour) **1st prize best talk.**
2018 A.S.A.B. Travel grant conference, **500 £**
2015 QMUL PhD Scholarship (2015) **67 000 £**
2014 1st prize for best poster presentation (F1000), 15th French Conference on invertebrate Neurobiology, Toulouse.

Edition and review

PLOS One - Reviewer (2025-now)
Animal behaviour - Reviewer (2024-now)
Animal cognition - Reviewer (2024-now)
Apidologie - Reviewer (2023-now)
eLife - Reviewer (2023-now)
Insects - Reviewer (2022-now)
Frontiers in Behavioural Neuroscience - Guest editor (2022) and reviewer
Journal of Experimental Biology - Reviewer (2018-now)
Frontiers - Reviewer (2018-now)

Professional skills

IT skills: Pack Office, Statistics and modelling (R, Statistica, Sigma Plot, MATLAB, SPSS, Python), LaTeX, AMIRA, Image J, computer aided-illustration, anatomical drawings, 3D printer and related software, Arduinos, Blender, website design.

Scientific skills: Behavioural tests, pharmacological tools, Nanodrop, Immunohistochemistry, immunohistofluorescence, DNA / RNA extraction and purification, qPCR, 2D/3D video analysis, micro-CT, anatomical and physiological measures (*e.g.* respirometer), morphometrics, hemolymph extraction, glucose concentration, isotropic fractionator and more.

Soft skills: problem-solving skills, rigor and autonomy, collaboration, initiative, adaptability, responsiveness, teamwork, pedagogy, science communication.

Scientific articles (published)

14. MaBouDi H., Roper M., **Guiraud M.G.**, Juusola M., Chittka L., Marshall J. A.R. (2025) A neuromorphic model of active vision shows how spatiotemporal encoding in lobula neurons can aid pattern recognition in bees. eLife https://doi.org/10.7554/eLife.89929 [Impact factor 6.4, Rank Q1, Citation 5]

13. MaBouDi H., Richter J., **Guiraud M.G.**, Roper M., Marshall J. A.R., Chittka L. (2025) Active vision of bees in a simple discrimination task. eLife https://doi.org/10.7554/eLife.106332 [Impact factor 6.4, Rank Q1, Citation 4]

12. **Guiraud M.G.,** Gallo V., Quinsal-Keel E., Maboudi H. (2024). Bumblebee visual learning: simple solutions for complex stimuli. Animal behaviour. https://doi.org/10.1016/j.anbehav.2024.123070 [Impact factor 2.5, Rank Q1, Citation 4]

11. **Guiraud M.G.**, Maboudi H., Woodgate J., Bates O., Ramos Rodriguez O., Gallo V., Barron A. (2024). How bumblebees manage conflicting information seen on arrival and departure from flowers. Animal cognition. https://doi.org/10.1007/s10071-024-01926-x [Impact factor 2.7, Rank Q1, Citation 4]

10. Gérard M., **Guiraud M.,** Cariou B., Henrion M, and Baird E. (2023). Elevated developmental temperatures impact the size and allometry of morphological traits of the bumblebee *Bombus terrestris*. Journal of Experimental Biology. https://doi.org/10.1242/jeb.245728 [Impact factor 3.3, Rank Q2, Citation 25]

9. **Guiraud M.*,** Roper M.*, Wolf S., Woodgate J. L. and Chittka L. (2022) Discrimination of edge orientation by bumblebees PLOS ONE. https://doi.org/10.1371/journal.pone.0263198 [Impact factor 3.7, Rank Q2, Citation 7]

8. Perl C.D., Johansen Z.B., Moradinour Z., **Guiraud M.,** Restrepo C.E., Jie V.W., Miettinen A., Baird E. (2022) Heatwave-like events during development are sufficient to impair bumblebee worker responses to sensory stimuli. Frontiers. https://doi.org/10.3389/fevo.2021.776830 [Impact factor 3.4, Rank Q2, Citation 27]

7. Perl C.D., Johansen Z.B., Jie V.W., Moradinour Z., **Guiraud M.,** Restrepo C.E., Miettinen A., Baird E. (2022) Substantial variability in morphological scaling among bumblebee colonies. Royal Society Open Science. https://doi.org/10.1098/rsos.211436 [Impact factor 3.5, Rank Q2, Citation 7]

6. **Guiraud M.*,** Cariou B.*, Henrion M.*, Baird E., Gerard M. (2021) Higher developmental temperature increases queen production and decreases worker body size in the bumblebee Bombus terrestris. Journal of Hymenoptera Research. https://doi.org/10.3897/jhr.88.73532 [Impact factor 1.8, Rank Q2, Citation 39]

5. Baird E., Tichit P.*, **Guiraud M.*.** The neuro-ecology of bee flight behaviours. (2020) Current opinion in insect science. https://doi.org/10.1016/j.cois.2020.07.005 [Impact factor 5.3, Rank Q1, Citation 18]

4. **Guiraud M.*,** Roper M.* & Chittka L. (2018) High-Speed Videography Reveals How Honeybees Can Turn a Spatial Concept Learning Task Into a Simple Discrimination Task by Stereotyped Flight Movements and Sequential Inspection of Pattern Elements. Frontiers in Psychology, 9:1347. https://doi.org/10.3389/fpsyg.2018.01347 [Impact factor 3.8, Rank Q1, Citation 30]

3. **Guiraud M**., Hotier L., Giurfa M. & de Brito Sanchez M.G. (2018) Aversive gustatory learning and perception in honey bees. Scientific Reports. https://doi.org/10.1038/s41598-018-19715-1 [Impact factor 4.6, Rank Q2, Citation 27]

2. **Guiraud M**., Maboudi H., Aniculaesei T.C., Chittka L. (2017) What can bee scanning tell us about visual pattern recognition. Scientific Reports. Perception vol.46, iss 10, 1231-1231, Sage publications LTD.

1. **Guiraud M.***, Mengoni Goñalons C.*, de Brito Sanchez M.G., Farina W.M. (2017) Insulin effects on honeybee appetitive behaviour. Journal of Experimental Biology. https://doi.org/10.1242/jeb.143511 [Impact factor 3.3, Rank Q2, Citation 22]

Scientific articles (BiorXiv/unpublished) _____

7. **Guiraud M.G.,** Salomons H., Hare B., Barron A.B. (2026) One Task, Two Minds: How Bees and Dogs Solve a Classic Memory Problem. (*in prep.)*

6. **Guiraud M.G**., Hines A., Jin M., Barron A.B. (2026) Active vision enables complex object recognition of human faces in honeybees. (*in prep*.)

5. MaBouDi H.*, **Guiraud M.G.***, Juusola M.,Barron A.B. (2026) Active Decision-Making in Free-Flying Honeybees During Visual Proportion Discrimination (*in prep.)*

4. **Guiraud M.G**.*, MaBouDi H.*, Chittka L., Barron A.B. (2026) Seeing by Moving: Active Vision and Shape Discrimination in Bumblebees (*in prep.)*

3. **Guiraud M.G.,** Gerard, M., Baird, E. (*in prep.).* From brain to behaviour, trade-off between sizes and performance. *Royal Society B.*

2. Maboudi H., Roper M., **Guiraud M.G.,** Chittka L., Marschall J. A.R. (2023). A neuromorphic model of active vision shows spatio-temporal encoding in lobula neurons can aid pattern recognition in bees *Bombus terrestris*. (in review, Current Biology) bioRxiv. https://doi.org/10.1101/2023.06.04.543620 [Impact factor 0, Rank N/A, Citation 5] – *now published #14.*

1. Maboudi H., Roper M., **Guiraud M**., Marschall J. A. R., Chittka L. (2021) Automated video tracking and flight analysis show how bumblebees solve pattern discrimination task using active vision. (in prep. Scientific reports). BioRxiv. https://doi.org/10.1101/2021.03.09.434580 [Impact factor 0, Rank N/A, Citation 7] - *now published #13.*

Presentations

19. **Guiraud M-G** (April 2025) "Updates on everything bee in the lab: memory, cognition, bee vision and future projects". Major Transition Workshop, Kiola Coastal Campus, ANU, Au. Talk (organiser and presenter).

18. **Guiraud M-G** (Feb 2025) "Mini-brain for Maximum power, the incredible bee" Public lecture, Discoveries series, Macquarie University, Sydney. Talk.

17. **Guiraud M-G** (August 2024) "Active vision in bees. Tell me what you see, I'll tell you who you are" **I.C.E (International Congress of Entomology) Kyoto, Japan**. Poster.

16. **Guiraud M-G** (July 2024) "Bees' scanning strategies for insect-inspired engineering solutions" **I.U.S.S.I (International Union for the Study of Social Insects) Lausanne**, Sw. Talk.

15. **Guiraud M-G** (July 2024) "Active vision and pattern recognition in bees, examples from nature's magic well", **Marseille University, Fr. Invited Talk.**

14. **Guiraud M-G** (April 2024) "Short-term memory assays in comparative cognition, insights from birds and bees", Major Transition Workshop, Kiola Coastal Campus, ANU, Au. Talk (organiser and presenter).

13. **Guiraud M-G** (March 2024) "Bee-inspired solutions for future engineering applications, new ideas and directions", ARCANI Conference and Major Transition Workshop, Macquarie University, Au. Talk (organiser and presenter).

12. **Guiraud M-G** (Sept 2023) "Active vision: Bees tell us where to look - elegant & simple solutions to complex problem-solving". **Space & Numbers in Animal Minds, Canberra, Au. Invited Talk.**

11. **Guiraud M-G** (July 2023) "Visual cognition in bees". Sydney's bee day, University of Sydney, Au. Talk

10. **Guiraud M-G** (March 2023) "Active vision: Bees tell us where to look - elegant & simple solutions to complex problem-solving". Types of Minds, Macquarie University, Au (organiser and presenter). Talk.

9. **Guiraud M** (Oct 2019) "Impact of climate change on behaviour, morphology and brain anatomy of Bombus terrestris". Tovetorp field station, Sweden (organiser and presenter). Talk

8. **Guiraud M**., Gallo V. (April 2019) "Bee navigation and 3D tracking related to visual puzzles". **Royal Holloway College, Egham, UK - 10th Conference on Animal Navigation.** Talk.

7. **Guiraud M** (April 2018) "Testing Biederman's theory in the bee: are vertices or edges prioritised in pattern discrimination?" **University of Plymouth, UK - A.S.A.B. conference** (travel grant obtained). **1st prize best talk.**

6. **Guiraud M** (Feb 2018) "From the lab to your yard: what visual puzzles tell us about the importance of crops' variety in our fields" **Beekeeper Central Association, UK. Invited Talk.**

5. **Guiraud M** (2016, 2017, 2018) “Active vision and pattern recognition in bees” SBCS, UK.1st year talk, 2nd year poster, 3rd year talk.

4. **Guiraud M.**, Maboudi H., Aniculaesei T.C, Chittka L. (Dec 2016) “What Can Bee Scanning Tell Us About Visual Pattern Recognition” **QMUL, UK – A.V.A (Vision Association) Conference**. Talk.

3. **Guiraud M** (Oct 2014) “Insulin effects on honeybee appetitive behaviour.” **French Research Network in Ethology, Tours,** France. Poster.

2. **Guiraud M.**, Giurfa M. (July 2014) “Aversive taste conditioning in the honeybee: neuronal mechanisms and pathways.” **I.U.S.S.I., Cairns, Australia.** Poster.

1. **Guiraud M** (July 2014) “Aversive taste conditioning in the honeybee: neuronal mechanisms and pathways.” **15th French Conference on invertebrate Neurobiology, Toulouse**, Fr. **1st prize for best poster presentation (F1000).**

Theses

PhD - **Guiraud M** (2020) Pattern recognition and active vision in bees Queen Mary University of London, UK. (Citations 2).

Masters - **Guiraud M** (2014) Aversive taste conditioning in the honeybee: neuronal mechanisms and pathways. University of Paris XI, France (with honours).

Selected media

Featured in Cosmos magazine (Dec 2024)“Insect consciousness: the minds of flies and psyche of bees. (https://cosmosmagazine.com/nature/insect-consciousness-the-minds-of-flies-and-psyche-of-bees/)

Guiraud M-G (May 2022). Podcast on “Weird facts about animals” – in French, Twitch, Nature'N Clic – (online). Talk. (https://www.marieguiraud.com/science-popularization)

Guiraud M-G (May 2022). “Everything you want to know about bees” – in French, Twitch, Nature'N Clic – (online). Talk. (https://www.marieguiraud.com/science-popularization)

Chittka L., **Guiraud M.** (2017) Save the London bees. BBC London (https://www.marieguiraud.com/science-popularization)

Certifications and languages

First aid certifications
Provide cardiopulmonary resuscitation - HLTAID009; Provide basic emergency life support - HLTAID010; Provide First Aid - HLTAID011

Languages
French (mother tongue), English (fluent), Spanish (fluent), Catalan (basics), Swedish (basics).

Hobbies

Flying small planes, macro-photography, paintings, writing SF's novels and outreach (working on a popularisation book about bees).