

**Program for Hiring Postdoctoral Researchers in New Collaborative Projects –
María de Maeztu Unit of Excellence – CIMCYC**

Research project: Reconstructive Dynamics of Visual Working Memory under Attention Shifts (ReDAS)

Principal Investigators:

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Summary: The main aim of this collaborative project is to investigate how shifting attentional priority affects the representational format of information stored in visual working memory (VWM). In a recent study, we showed that when multiple items are held in VWM, semantic information (conceptual meaning) is accessed faster and more accurately than perceptual details, suggesting dynamics similar to those observed in episodic long-term memory (LTM) retrieval. In contrast, when only a single item is under full attention, no such semantic prioritisation is observed (Kerrén et al., 2022). Building on these findings, this project will examine whether semantic-over-perceptual prioritisation can be dynamically modulated by attentional cues and encoding format. Specifically, we will test if retrocues (used to direct internal attention to memory items) can preserve high-fidelity perceptual representations and whether presenting items simultaneously vs. sequentially at encoding influences the retrieved memory format.

The novelty of the project lies both in the research question and in the methodological approach, which integrates behavioral measures (accuracy and reaction times for semantic vs. perceptual memory judgments), electroencephalography (EEG) decoding of neural representations and drift diffusion modeling (DDM). This multi-method approach will trace the temporal dynamics of how VWM content is reconstructed under different attention conditions. Scientifically, the work addresses a fundamental question about the states of working memory, bridging gaps between working memory and long-term memory (LTM) theories. The expected outcomes include a deeper understanding of how attention can transform memory content, with implications for cognitive theory and potential translational benefits such as strategies to improve memory retention under high load.

Position: 1 Postdoctoral Researcher contract - María de Maeztu Unit of Excellence – CIMCYC

Job description: Postdoctoral researcher for the collaborative research project “Reconstructive Dynamics of Visual Working Memory under Attention Shifts (ReDAS)” from the María de Maeztu Unit of Excellence at the Mind, Brain, and Behavior Research Center (CIMCYC) at the University of Granada. The tasks to be performed include:

- Design and implementation of experimental visual working memory tasks with retrocue manipulations and encoding formats (simultaneous vs. sequential).
- Programming experiments in Python (PsychoPy), MATLAB (Psychtoolbox), and/or jsPsych, and preparation of materials and stimuli.
- Development of the project's data management plan.
- Acquisition of behavioral and EEG data in the laboratory, including quality control and participant management.

- EEG preprocessing (filtering, artifact correction, etc.) and advanced analysis, including multivariate decoding and temporal semantic/perceptual reactivation analyses.
- Adjustment and validation of computational decision-making models (drift diffusion modeling), including hierarchical Bayesian modeling (HDDM).
- Multimodal integration of results (behavioral, EEG, and models) and regular communication with PIs and international collaborators for joint interpretation.
- Preparation of pre-registrations, code documentation, and data management following FAIR and open science standards.
- Drafting scientific manuscripts and preparing presentations for international conferences (e.g., CNS, ICON, SfN).
- Contributing to the dissemination, transparency, and reproducibility of the project by uploading materials, code, and anonymized data to open repositories.
- Participation in the preparation of funding applications.
- Contribution to the supervision and training of doctoral and master's students and research assistants.
- Scientific dissemination activities aimed at non-specialist audiences.

REQUIREMENTS

Qualification: PhD degree

Desirable skills

- High motivation to support Open Science in research.
- Meticulous attention to detail and excellent organisational skills.
- Ability to work on multiple projects simultaneously, set priorities, and meet deadlines.
- Strong interpersonal skills, ability to motivate individuals and groups both independently and as part of different teams.
- Willingness to undertake further training and autonomous learning, where appropriate.

EVALUATION CRITERIA

Training (30%)

- Advanced training in EEG methods: preprocessing, multivariate analysis, time-frequency, decoding.
- Training in scientific programming (Python, MATLAB, R, or similar) and behavioral experiment design.
- Training or demonstrable experience in computational modeling, especially in evidence accumulation models (DDM/HDDM).
- Statistical knowledge in R, MATLAB, Python, or similar.
- Training in the study of the relationships between attention and working memory.
- English and/or Spanish language accreditation, if applicable (C1 certificate or equivalent fluency, if applicable).

Experience (40%)

- Collection and analysis of EEG data in memory, perception, or attention studies.
- Working memory tasks, retrocue manipulation, or multi-item paradigms.
- Multivariate decoding or advanced analysis of brain signals.
- Computational modeling of behavior (DDM) and Bayesian analysis.

- Practices related to Open Science (e.g., pre-registration of research plans, publication of research material in open repositories, code used for data collection and/or analysis, anonymized raw data and research results, publication of open preprints in green repositories, etc.).
- Dissemination of research to non-specialist audiences.

Other criteria (30%)

- Relevant scientific publications on memory, attention, or cognitive neuroscience.
- Experience and international projection of the research career in prestigious centers (e.g., country and centers where the different stages of training were completed: master's, bachelor's, doctorate, and postdoctoral experience; stays at foreign research centers; network of prestigious international collaborations reflected in publications, etc.).
- Letters of recommendation. Letter of motivation for the position.
- Personal interview (if applicable).

OTHER RELEVANT INFORMATION

The working languages at CIMCYC are Spanish and English.

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