

Call for a Post-Doctoral Researcher in Human psychophysical studies of eye-head coordination under dynamic sensorimotor conditions.

**Department of Biophysics – Donders Centre for Neuroscience,
Radboud University, Nijmegen, the Netherlands**

Background of the project: Rapid object identification is crucial for survival of all organisms, but poses daunting challenges if many stimuli compete for attention, and multiple sensory and motor systems are involved in the processing, programming and generating of an eye-head gaze-orienting response to a selected goal. How do normal and sensory-impaired brains decide which signals to integrate (“goal”), or suppress (“distracter”)? Audio-visual (AV) integration only helps for spatially and temporally aligned stimuli. However, sensory inputs differ markedly in their reliability, reference frames, and processing delays, yielding considerable spatial-temporal uncertainty to the brain. Vision and audition utilize coordinates that misalign whenever eyes and head move. Meanwhile, their sensory acuities vary across space and time in essentially different ways. As a result, assessing AV alignment poses major computational problems, which so far have only been studied for the simplest stimulus-response conditions.

Our novel approaches will tackle these problems on different levels, by applying dynamic eye-head coordination paradigms in complex dynamic environments, while systematically manipulating visual-vestibular- auditory context and uncertainty. We parametrically vary AV goal/distracter statistics, stimulus motion patterns, and active vs. passive-evoked body movements. We perform advanced psychophysics to healthy subjects, and to patients with well-defined sensory disorders. We probe sensorimotor strategies of normal and impaired systems, by quantifying their acquisition of priors about the (changing) environment, and use of feedback about active or passive-induced self-motion of eyes and head. We further challenge current eye-head control models by incorporating top-down adaptive processes and eye-head motor feedback in realistic cortical-midbrain network models. Finally, in a collaborative project with the Instituto Superior Técnico in Lisbon, our modeling will be critically tested on an autonomously learning biomimetic robotic system, equipped with binocular foveal vision and human-like audition.

We have a Postdoctoral position (24 months) for our human psychophysics:

You will study multisensory-evoked goal-directed eye-head orienting movements in dynamic sensory environments (moving sound sources, distracters), with or without induced passive self-motion through a novel vestibular and audiovisual stimulator. We compare healthy

control subjects with patients suffering from sensory impairments (auditory, visual, vestibular).

The Donders Institute

As a postdoc you will participate in research training programmes offered by the Donders Institute (with 600 FTEs, the largest research institute of Radboud University), which will be tailored to individual interests. The Donders Centre for Neuroscience at the Faculty of Science studies sensory-motor integration in an interdisciplinary setting with unique state-of-the-art methodologies in well-equipped research labs and advanced computational facilities. The Donders Institute has a dedicated graduate school in which PhDs and postdocs are trained in modern research and analysis techniques, and acquire an academic and ethical attitude towards the applications of systems neuroscience. In the course of this project, you will have intensive contacts with our robotics colleagues from the Lisbon institute.

Educational background of the candidate:

(bio)physics, (medical, or neuro-)biology, cognitive neuroscience (psychophysics), or equivalent.

Duration: 2 years (with an intermediate evaluation after one year)

Salary: maximum of €4,274 gross per month based on a 38-hour working week (scale 10).

Starting date: a.s.a.p.

Interested candidates should express their interest by sending the following documents to j.vanopstal@donders.ru.nl

[Subject line: **ERC-693400-PD2**] and include:

- (1) Cover letter (max 1 page)
- (2) CV
- (3) Certificate of academic degree with grades.
- (4) Your PhD thesis or published papers
- (5) Name and contact of two referees.

More information can be found on our ORIENT website at http://www.mbfys.ru.nl/~johnvo/OrientWeb/orient_1.html

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