



3 years funded PhD :

Understanding the brain representation of food to reduce levels of salt and sugar using aroma

Quantitative study of brain responses to food with EEG and fMRI

When we eat, multiple types of **perceptions** arouse: aroma (olfaction), taste (gustation), color (vision), texture (somesthesia)... Multisensory integration allows the construction of a food mental image (flavor), which is a crucial step for food choice. A better understanding of brain mechanisms involved in flavor construction will contribute to the identification of the typical functioning of the flavor system which could be then compared to atypical functioning; e.g. in food disorders. It may also help in formulation of healthier food, as we work on solution models for which we try to compensate salt and sugar reduction by aroma.

Liking is strongly driven by taste intensity. Sugar, salt and fat actually govern our food choices. However, we know that sugar and salt perception can be induced also by aroma ("flavour induced" perception). The objectives of the project are to highlight the brain mechanisms behind "flavour-induced" perception and the role of this "flavour induced" perception in food choices. To answer these questions **fMRI** and **EEG** will be used.

The content of the PhD project is **multi-disciplinary**; therefore, the young researcher will gain background in Neurosciences and Sensory Evaluation in Food Sciences. The young researcher will benefit from the supervision by experts in each domain. EEG studies will take place in CSGA¹, the leading multidisciplinary research center for taste and feeding behavior, Dijon, **France**. fMRI studies will take place at the Smell & Taste Clinic², Dresden in **Germany**, which is a leading lab in brain imaging of chemical senses. Finally, for the fMRI design and data analysis, we work in close collaboration with the IVIA AgroRésonance platform in Clermont-Ferrand³, which has a key expertise in image analysis and artefact removal especially for food stimulations. Regarding the European network involved in the project, the student should be able to speak English and some knowledge of French would be appreciated.

Employment of latest PhD young researcher in our lab:

PhD in 2015: Actually: Sensory and Consumer Manager, **Danone, France**

2012: Research Scientist, **CSGA, France**

2012: Product and Sensory Scientist, **Heineken, Netherlands**

2010: Sensory project Manager, **Nestlé-Nespresso, Switzerland**

2009: Freelance in Sensory Evaluation Training, **France**



¹ <https://www2.dijon.inra.fr/csga/>

² <https://www.uniklinikum-dresden.de/de/das-klinikum/kliniken-polikliniken-institute/hno/forschung/interdisziplinaeres-zentrum-fuer-riechen-und-schmecken/homepage-in-englisch-1>

³ <http://www6.inra.fr/agroresonance>

2007: Sensory & Consumer Science Project Leader, **Unilever, Netherlands**

Skills and Knowledge required:

Necessary skills to lead this project are:

- Background in Neurosciences (EEG and/or fMRI) and/or Sensory Evaluation and/or Food Sciences. Research experience in chemosensory perception would be greatly appreciated.
- Team working ability and relational facilities are necessary, regarding the different partners who will be involved in the project and for the work with participants.
- English skills are necessary and French skills would be appreciated
- Skills with R statistical, and/or SPM (Matlab) fMRI analysis software, and/or Let'sWave EEG analysis software

Documents required to apply:

- CV up to date
- cover letter
- BSc, MSc or equivalent notes
- 2 recommendation letters
- Professional project post-PhD

Supervisors:

Dr. Charlotte Sinding, Neurosciences of food perception

Dr. Thierry Thomas-Danguin, Perception and psychophysics of complex food chemical stimuli

Contact:

Before 31/07/2018, please send the application to Dr. Charlotte Sinding at charlotte.sinding@inra.fr

If you have any question please contact Dr. Charlotte Sinding.

Start in Septembre 2018 (flexible).

Bibliography:

Bonny, J.M., Sinding, C., and Thomas-Danguin, T. **2017**. Functional MRI and Sensory Perception of Food. In: Modern Magnetic Resonance. Cham: Springer International Publishing. pp. 1–20.

Thomas-Danguin, T., Sinding, C., Tournier, C., and Saint-Eve, A. **2016**. Multimodal interactions. In: *Flavor From Food to Behaviors, Wellbeing and Health*. p. 430.

Sinding, C., Coureaud, G., Bervialle, B., Martin, C., Schaal, B., and Thomas-Danguin, T. **2015**. Experience shapes our odor perception but depends on the initial perceptual processing of the stimulus. *Attention, Perception, Psychophys.* 1–13.

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Nasri, N., Septier, C., Beno, N., Salles, C. & Thomas-Danguin, T. **2013**. Enhancing salty taste through odour–taste–taste interactions: Influence of odour intensity and salty tastants' nature. *Food Qual. Prefer.* 28, 134–140.

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Verhagen, J. V & Engelen, L. **2006**. The neurocognitive bases of human multimodal food perception: sensory integration. *Neurosci. Biobehav. Rev.* 30, 613–50.

Small, D. M. & Prescott, J. **2005**. Odor/taste integration and the perception of flavor. *Exp. Brain Res.* 166, 345–357.