## FENS Forum 2010 - Amsterdam

- Posters: to be on display from 8:00 to 13:15 in the morning and from 13:30 to 18:45 in the afternoon.
Poster sessions run from 09:30 to 13:15 in the morning and from 13:30 to 17:30 in the afternoon.
A one hour time block is dedicated to discussion with the authors (authors should be in attendance at their posters as from the time indicated.)
- For other sessions, time indicates the beginning and end of the sessions.

**First author**   Van Leeuwen, Tessa M (poster)

Poster board D90 - Mon 05/07/2010, 11:15 - Hall 1
Session 084 - Multisensory
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**Authors**   Van Leeuwen T. M., Den Ouden H. E. & Hagoort P.

**Address**   Radboud University Nijmegen, Donders Institute (RU/DI-BCB), Nijmegen, The Netherlands

**Title**   Bottom-up versus top-down: effective connectivity reflects individual differences in grapheme-color synesthesia

**Text**   In grapheme-color synesthesia, letters elicit a color. Neural theories propose that synesthesia is due to changes in connectivity between sensory areas. However, no studies on functional connectivity in synesthesia have been published to date. Here, we applied psycho-physiological interactions (PPI) and dynamic causal modeling (DCM) in fMRI to assess connectivity patterns in synesthesia. We tested whether synesthesia is mediated by bottom-up, feedforward connections from grapheme areas directly to perceptual color area V4, or by top-down feedback connections from the parietal cortex to V4. We took individual differences between synesthetes into account: 'projector'synesthetes experience their synesthetic color in a spatial location, while 'associators'only have a strong association of the color with the grapheme.

We included 19 grapheme-color synesthetes (14 projectors, 5 associators) and located group effects of synesthesia in left superior parietal lobule (SPL) and right color area V4. With PPI, taking SPL as a seed region, we found an increase in functional coupling with visual areas (also V4), for the synesthesia condition. With PPI, however, we can not determine the direction of this functional coupling. Based on the GLM results, we specified 2 DCMs to test whether a bottom-up or a top-down model would provide a better explanation for synesthetic experiences. Bayesian Model Selection showed that overall, neither model was much more likely than the other (exceedance probability of 0.589). However, when the models were divided according to projector or associator group, BMS showed that the bottom-up, feedforward model had an exceedance probability of 0.98 for the projectors: it was strongly preferred for this group. The top-down, feedback model was preferred for the associator group (exceedance probability = 0.96).

To our knowledge, we are the first to report empirical evidence of changes in functional and effective connectivity in synesthesia. Whether bottom-up or top-down mechanisms underlie synesthetic experiences has been a long-time debate: that different connectivity patterns can explain differential experiences of synesthesia may greatly improve our insight in the neural mechanisms of the phenomenon.

**Theme**   D - Sensory and motor systems
Multisensory