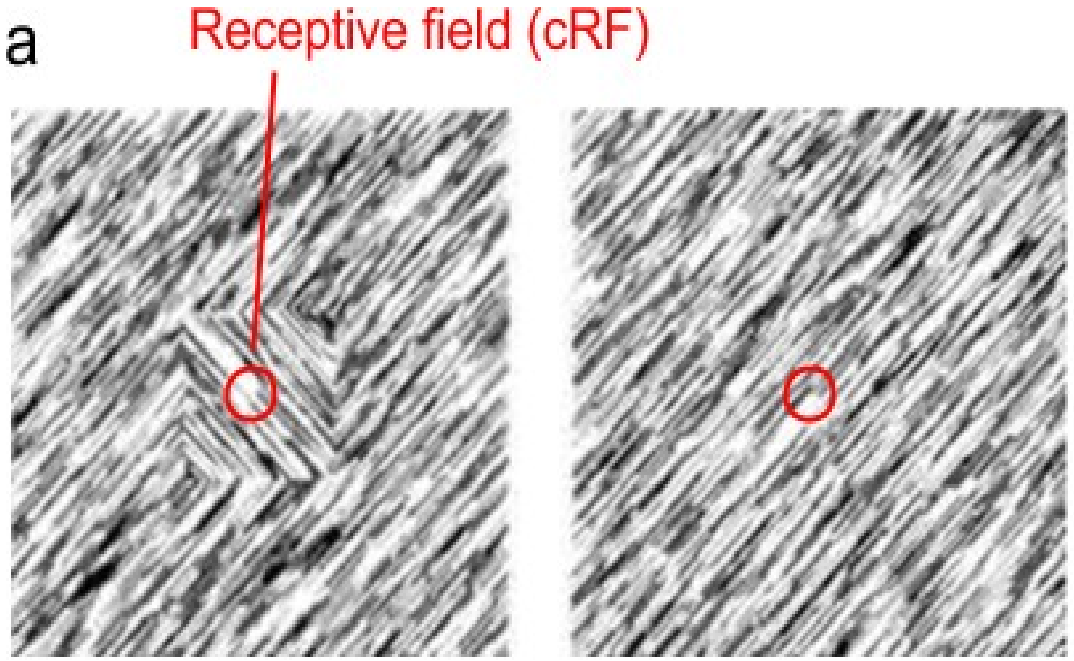
CHArting **M**ulti-areal Visual **P**erception in the **Mouse**

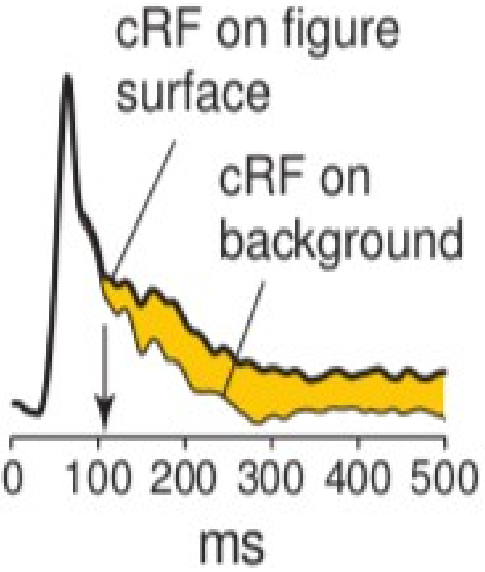
ChampMouse

J. Alexander Heimel

FlagEra Kick-off meeting
Budapest, April 13, 2016

First step of object recognition
Object segregation





Primate and human data

Aim
use a new figure-ground segregation task to chart visual processing in the mouse brain

Objective 1 – Behavioral task
devise a task where head-fixed mice decide if a figure is shown on a background.

Objective 2 – Recording neural activity at multiple scales and areas
measure the neural correlates of figure-ground segregation using electrophysiology and calcium imaging (wide field and 2-photon)

Objective 3 – Interfere with neural processing
determine by optogenetic silencing which areas perform the task.

Objective 4 – Modeling the neural interactions
use our data, with data from Allen Institute and HBP, to create a multi-area, multi-scale model of the mouse visual system

Consortium

Amsterdam

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Leuven

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Gustavo Deco

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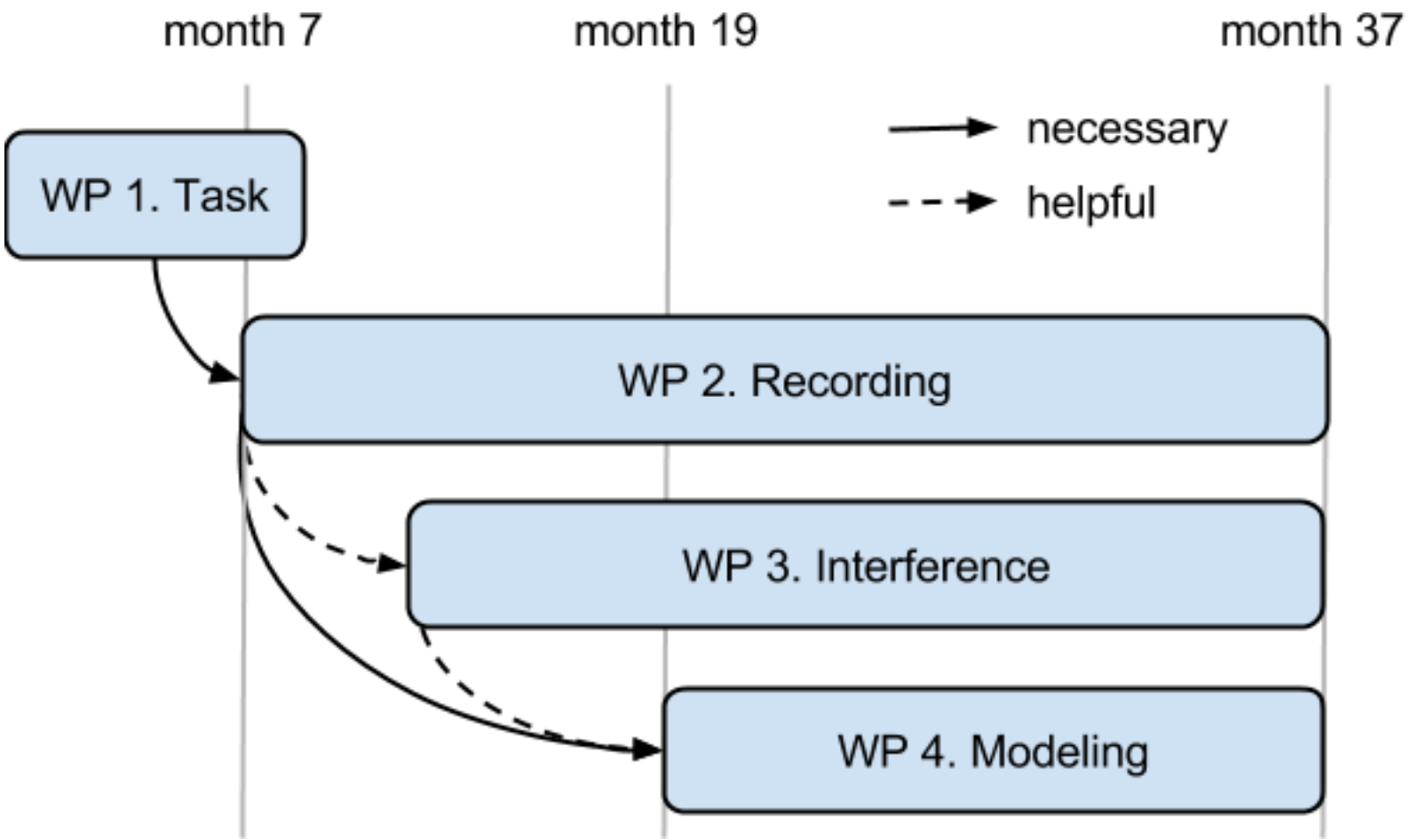

month 7
month 19
month 37
necessary
helpful
WP 1. Task
WP 2. Recording
WP 3. Interference
WP 4. Modeling

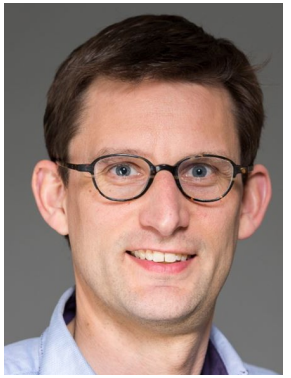
Task development

Roelfsema

Op de Beeck

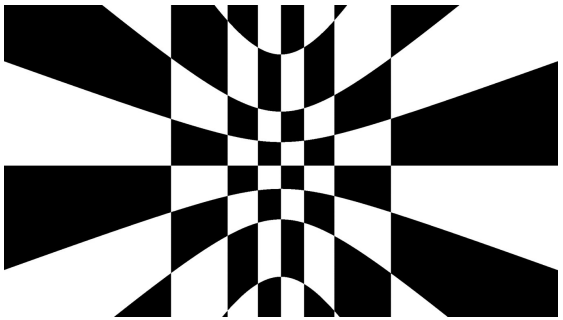
Electrophysiology
Calcium imaging
(wide field)

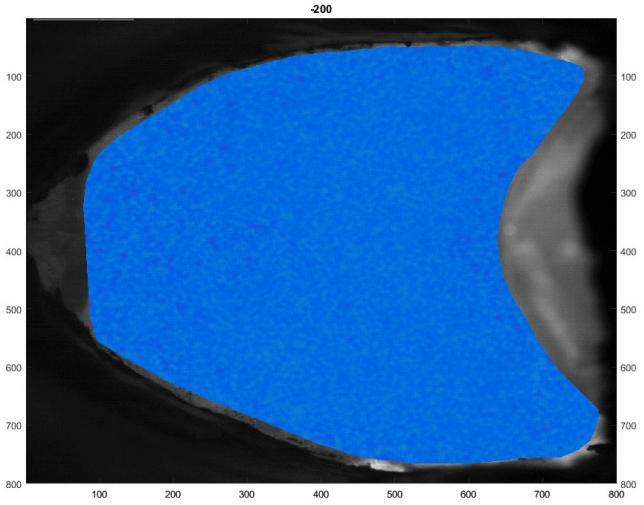
Op de Beeck

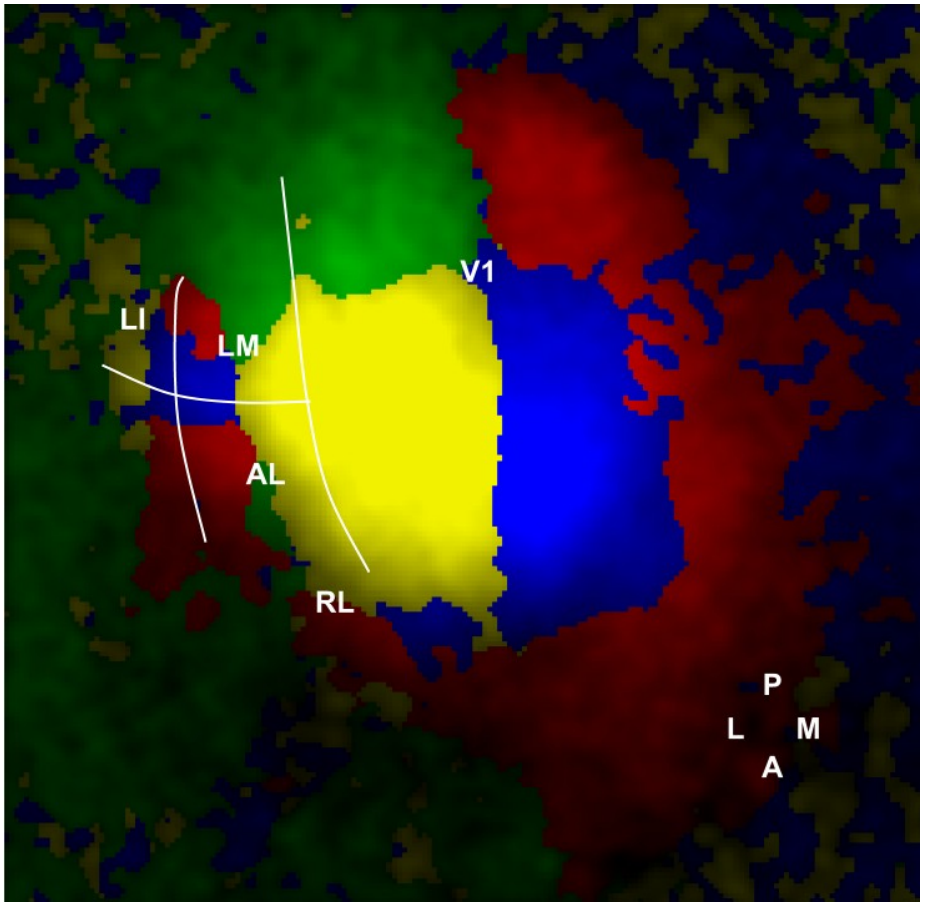


Heimel

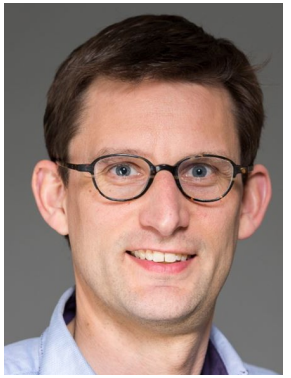
Roelfsema



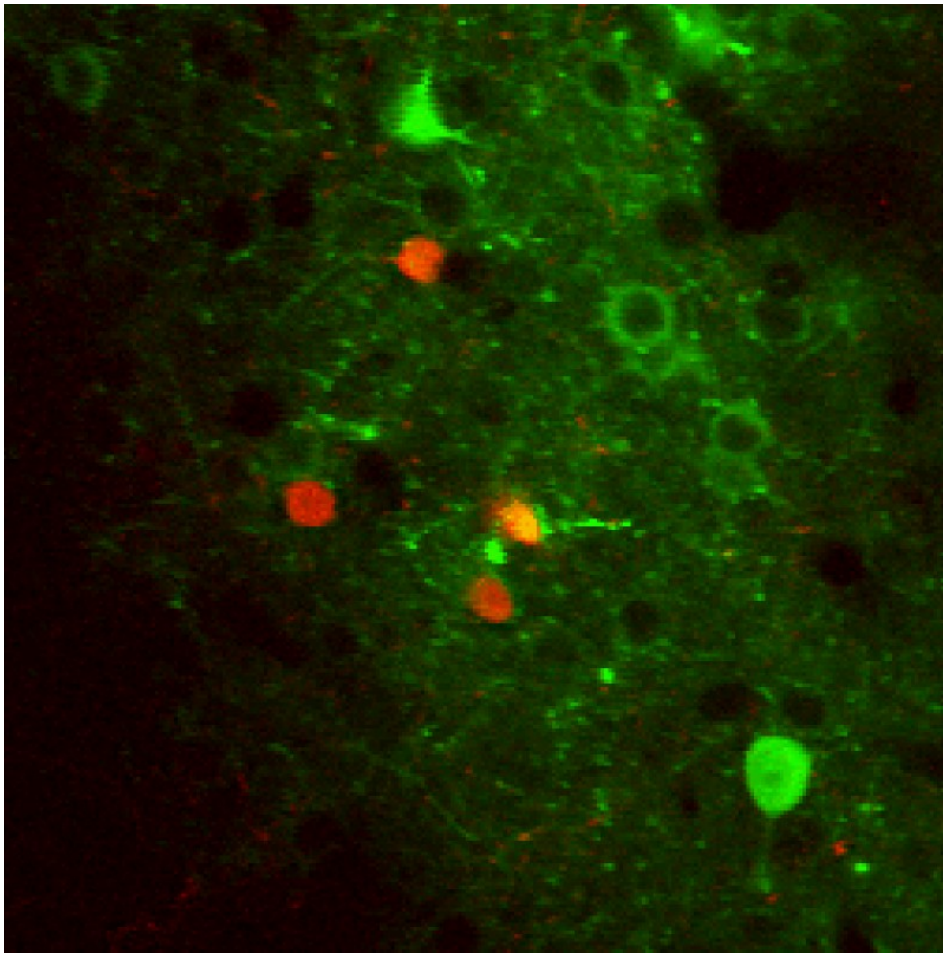




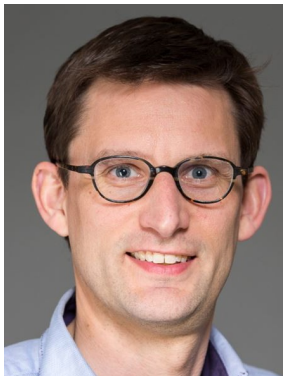
Calcium imaging (2 photon)



Roelfsema



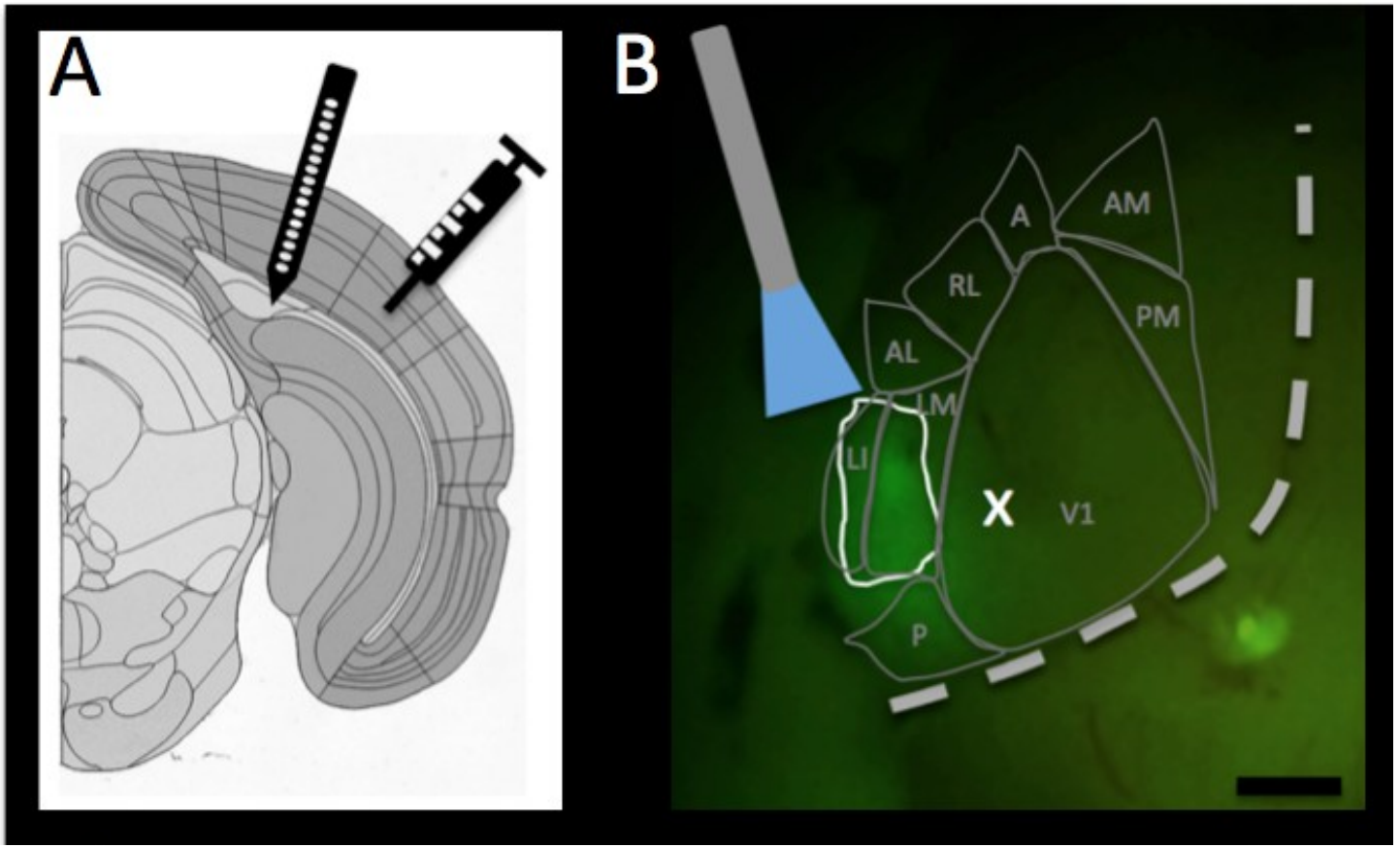
Interference Optogenetics



Heimel

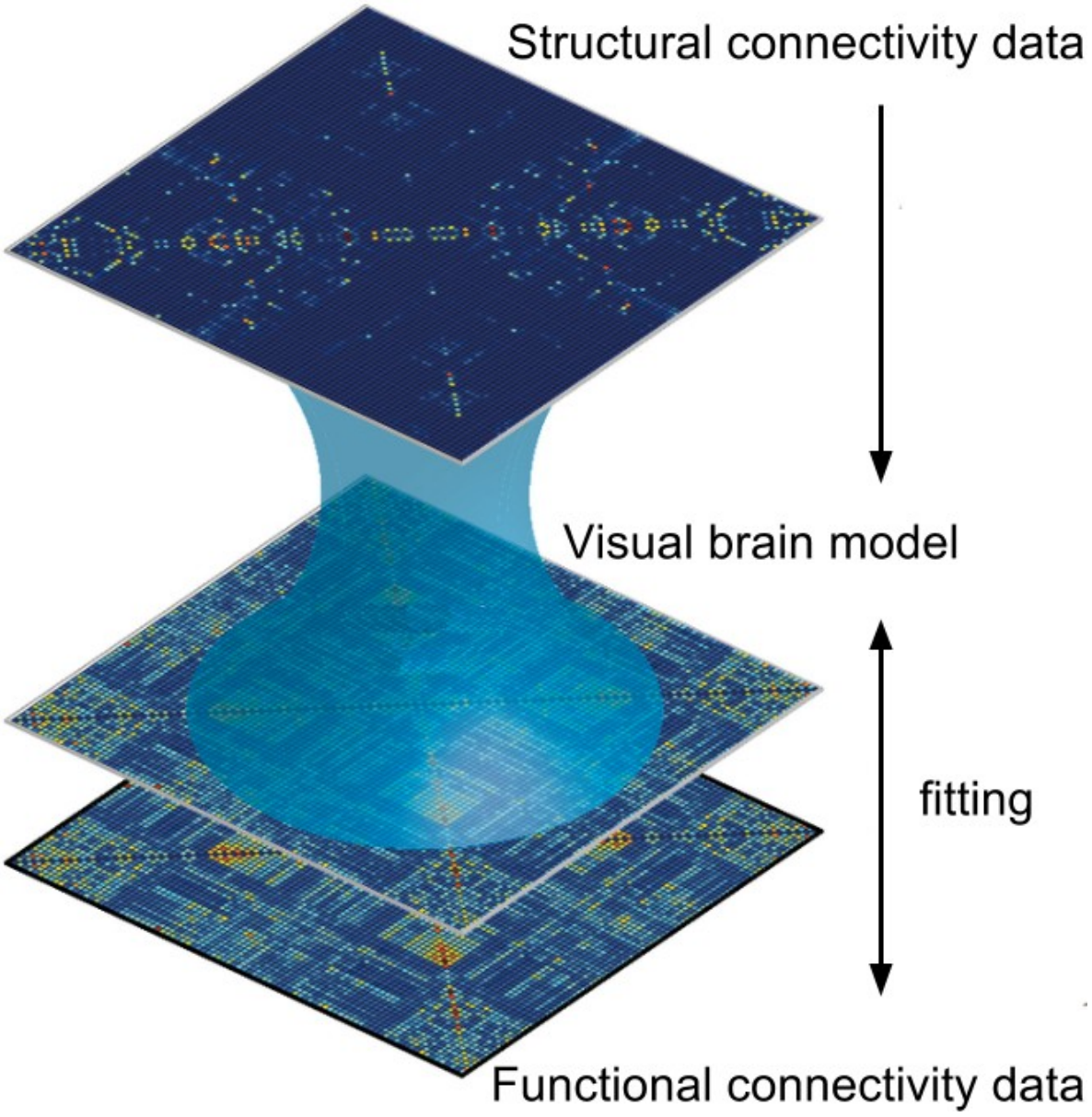
Roelfsema

Op de Beeck



Modeling

Gustavo Deco



Impact

Better understand visual processing across multiple levels and areas

Links to main aims of HBP

- Perform Targeted Mapping of the Mouse Brain and the Human Brain
- Develop a Multi-Scale Theory for the Brain

Primary interactions with HBP

- HBP Sub-project 1 “Strategic Mouse Brain Data” can guide our modeling of the mouse brain's algorithm to segregate a figure from the background.
- HBP Sub-project 5 “Neuroinformatics” delivering ICT Platforms, tools, Methods and Data Available to the Scientific Community
    - Neuroinformatics platform:
        - Downloading annotated maps of the mous brain
        - Uploading neural activity using the voxel brain API and ephys data
        - Uploading multiscale model
        - Use 3D viewers to visualize the data
    - HBP Sub-project 5 Brain Simulation Platform
        - Data can be used to feed or validate brain simulations