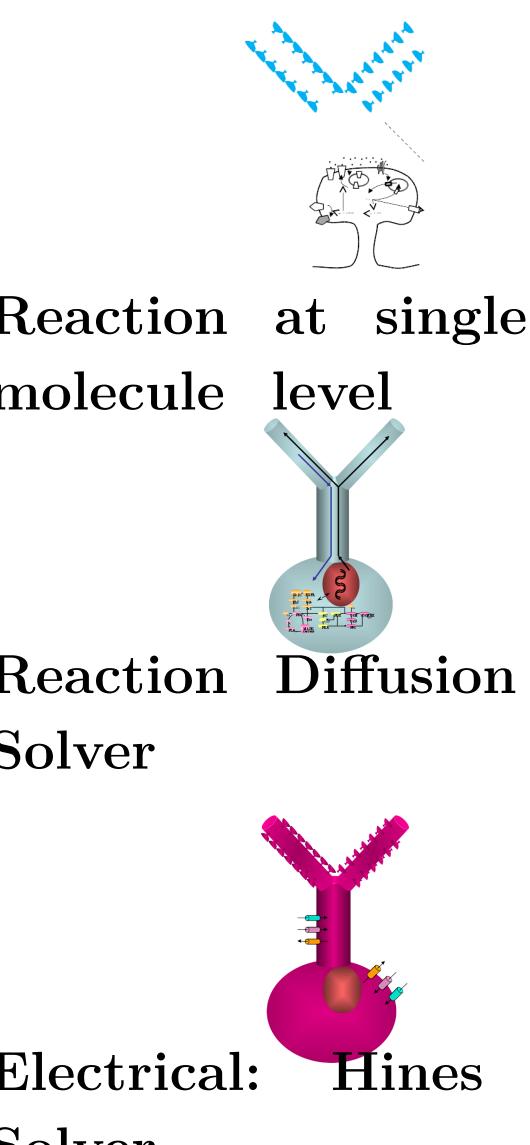
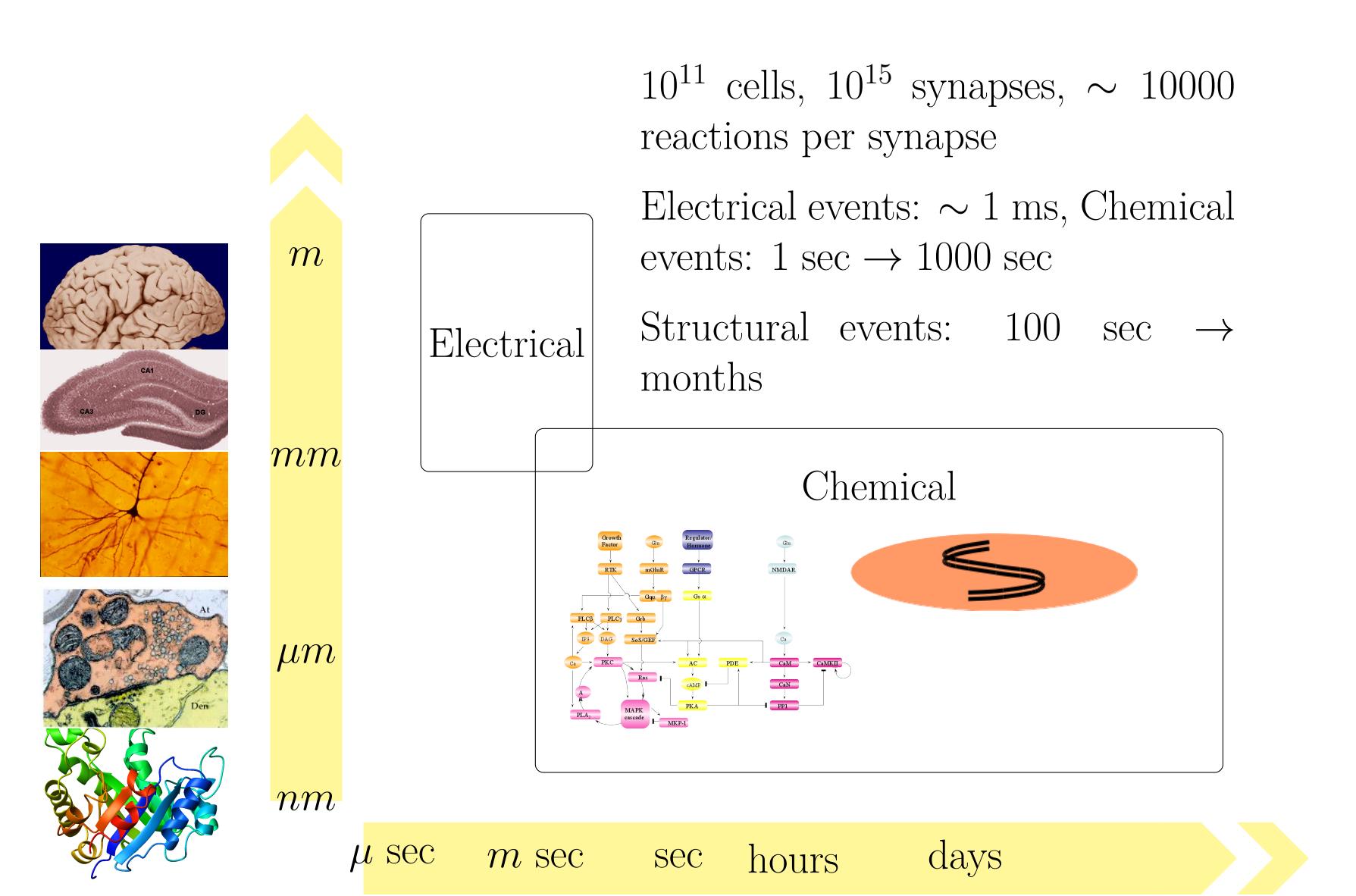


# Modelling Memory Across Scales

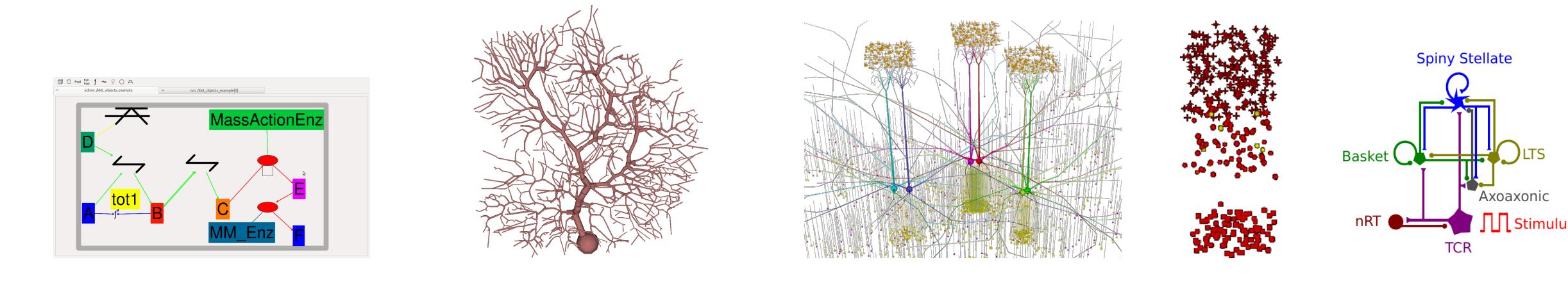
Subhasis Ray, Harsha Rani, Sahil Moza, Aditya Gilra, Aviral Goel, Dilawar Singh, Upinder Bhalla

## 1. Why Multiscale?

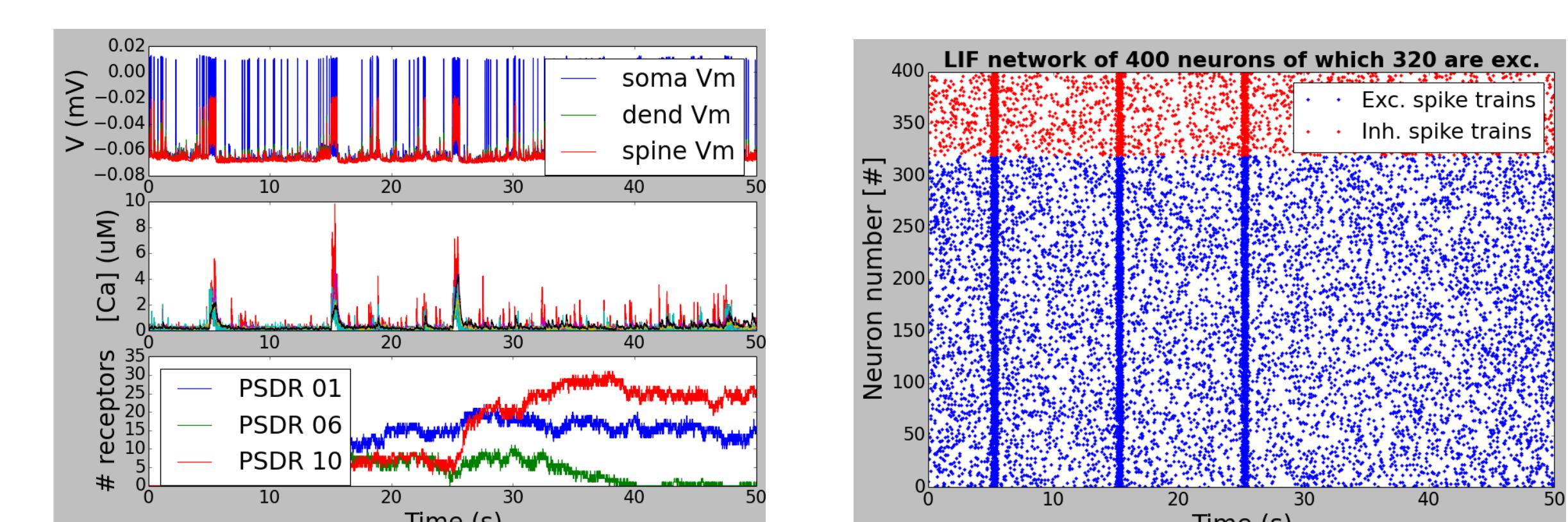
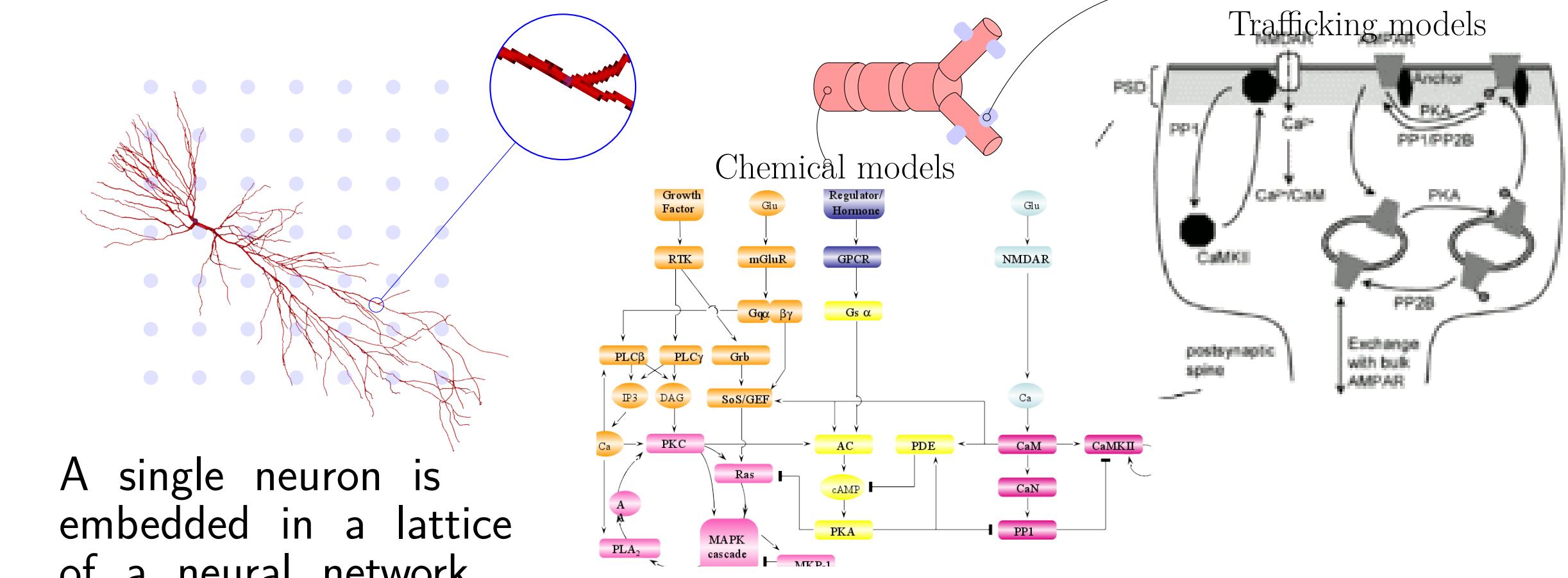
- Memory and plasticity involve brain mechanisms from molecular scale to enormous networks.
- We have developed MOOSE the Multiscale Object Oriented Simulation Environment, to model plasticity and brain computation across scales.



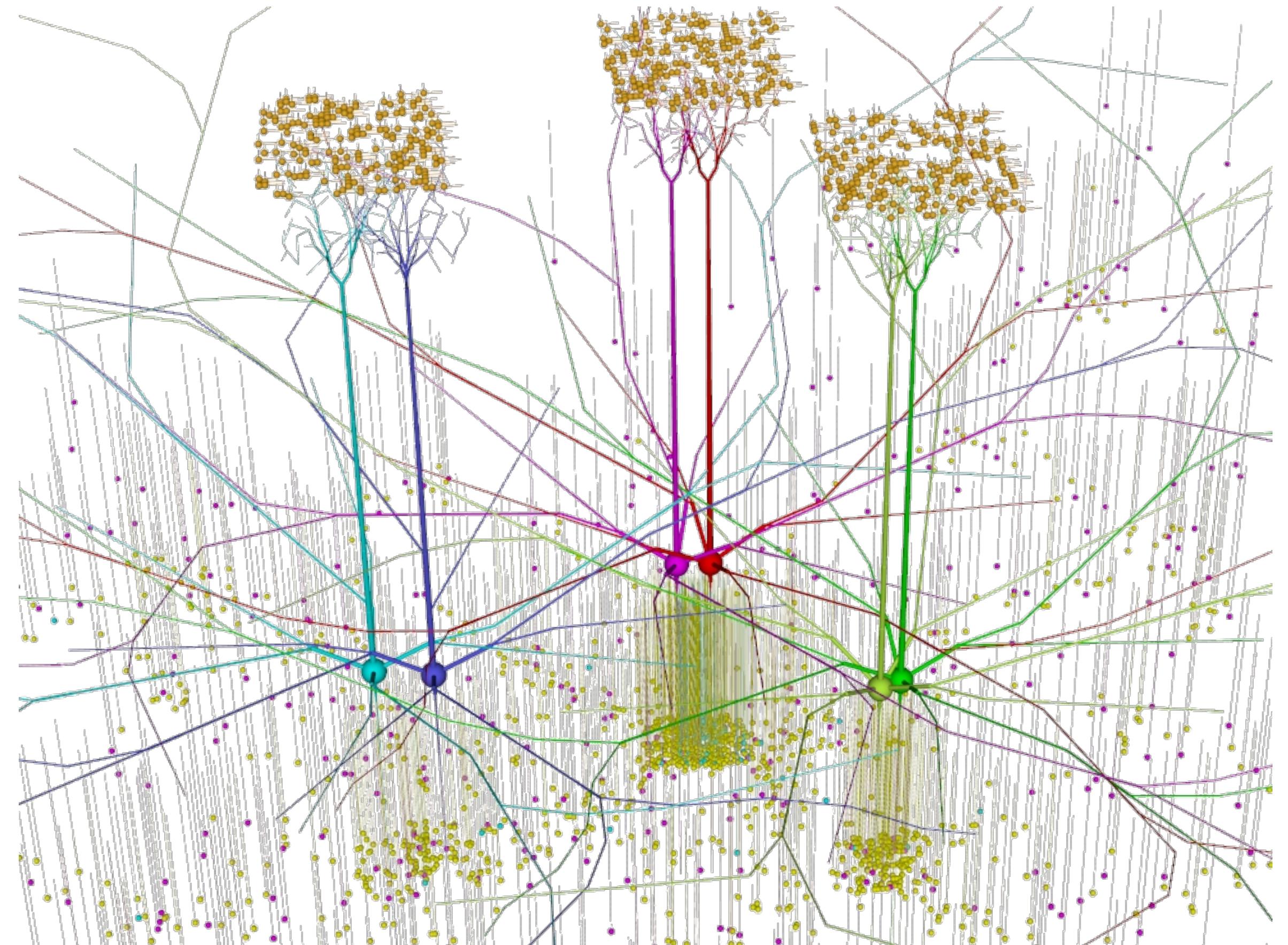
## 2. Some projects using MOOSE



### 2.1 MODELLING MEMORY

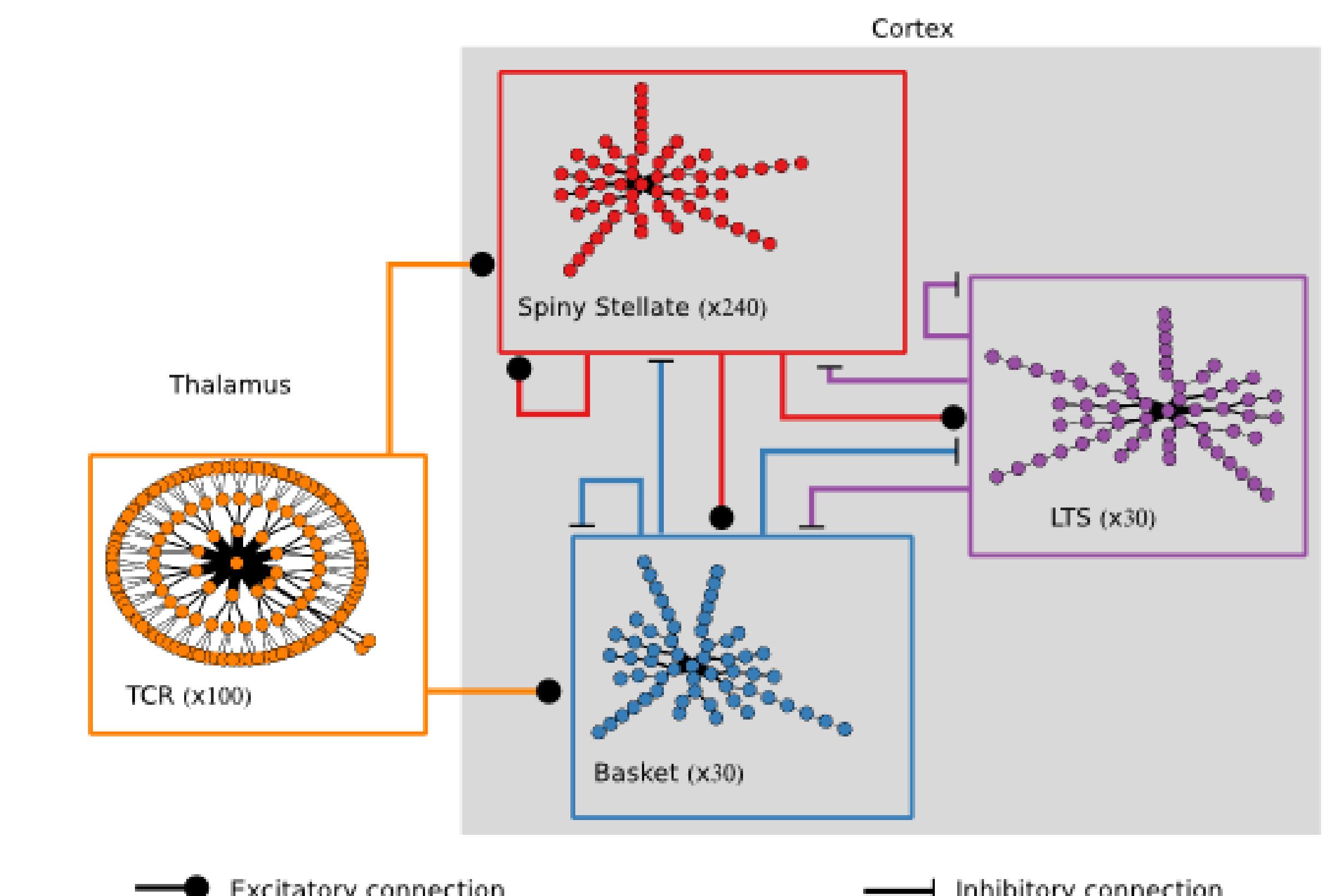


## 2.2 MODELLING OLFACTORY BULB

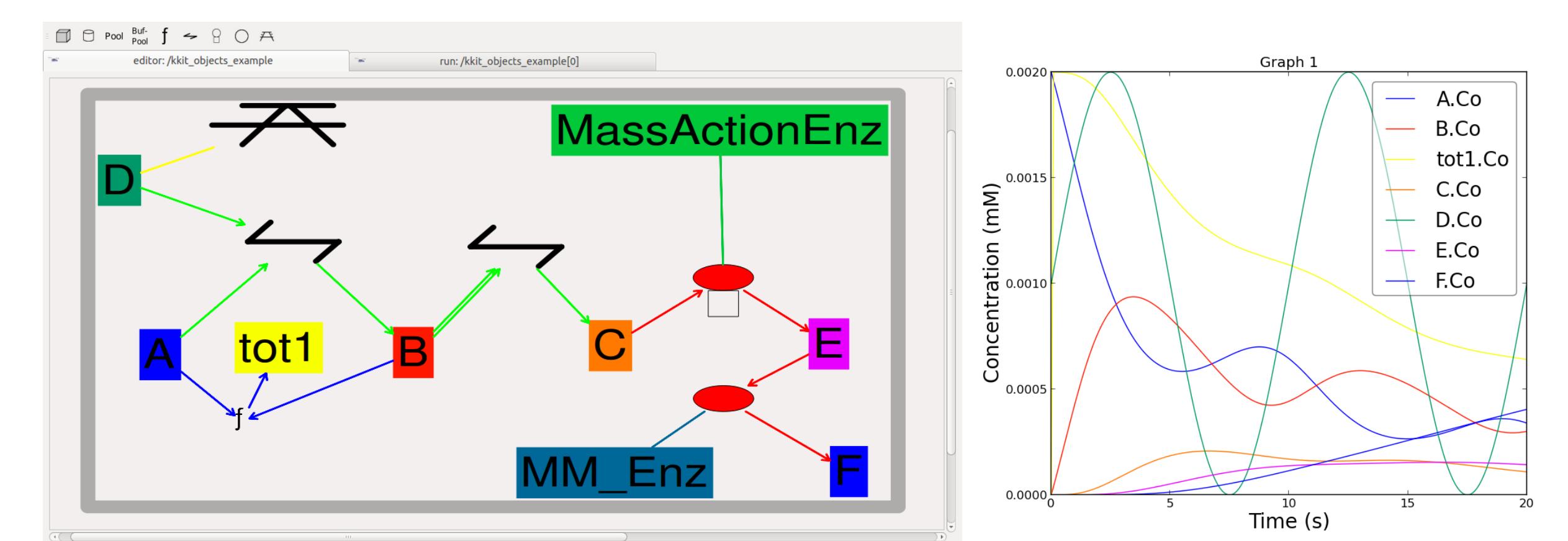


Network coding and computation in olfaction and somatosensory cortex. It explains linear coding and phase-decorrelation and predicts connectivity, lateral dendrite output structure.

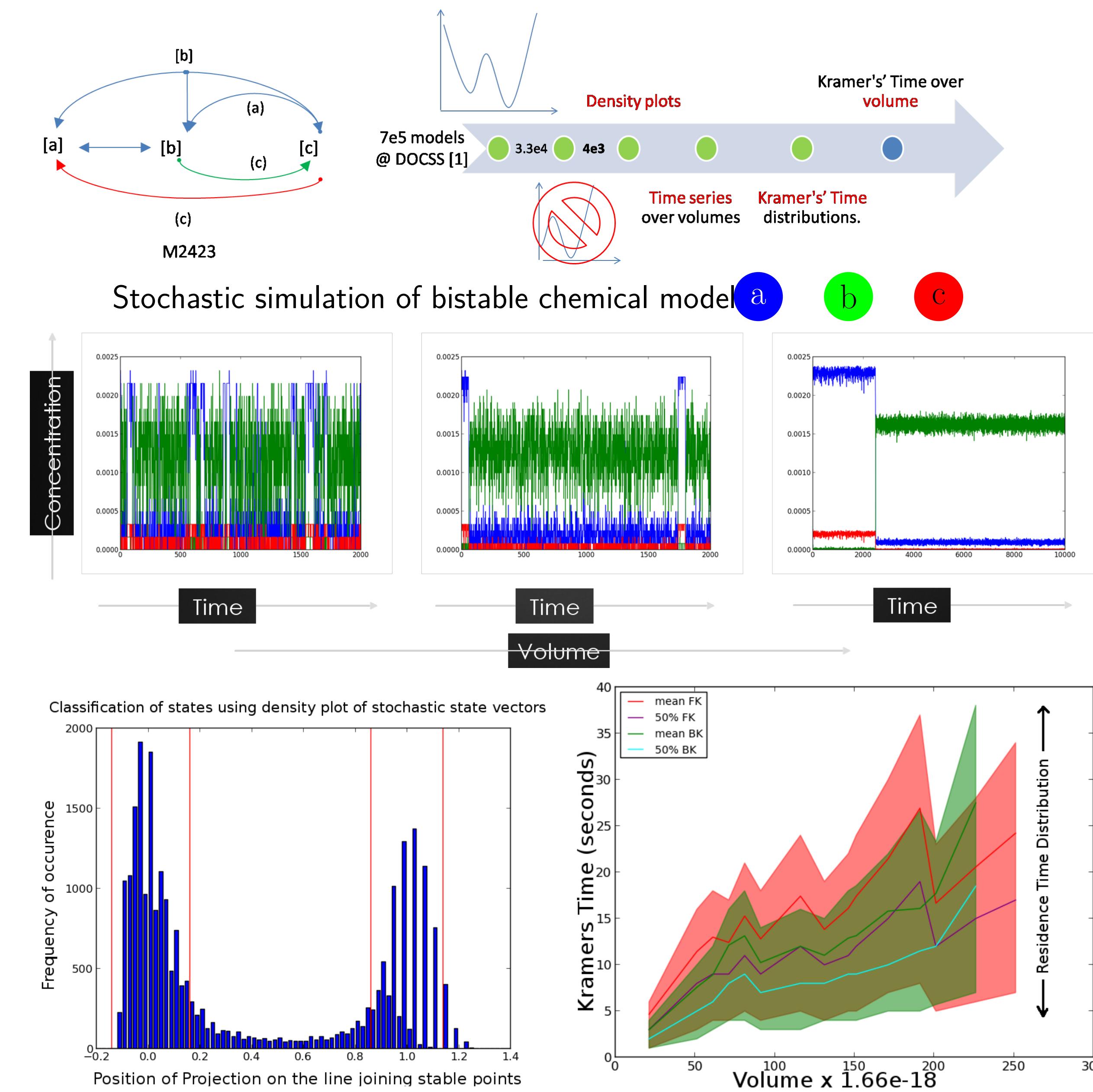
## 2.3 MODELLING CORTEX



## 2.4 MODELLING CHEMICAL SIGNALLING PATHWAYS



## 2.5 ROBUSTNESS OF CHEMICAL SWITCHES



## 3. Summary

We use models to,

- Integrate many scales of neuronal data with basic physical/chemical principles.
- Explain phenomena of plasticity, activity and neuronal coding.
- Predict circuit mechanisms, plasticity rules, and emergent phenomena such as *decorrelation*, *robustness*, and *memory decay*.