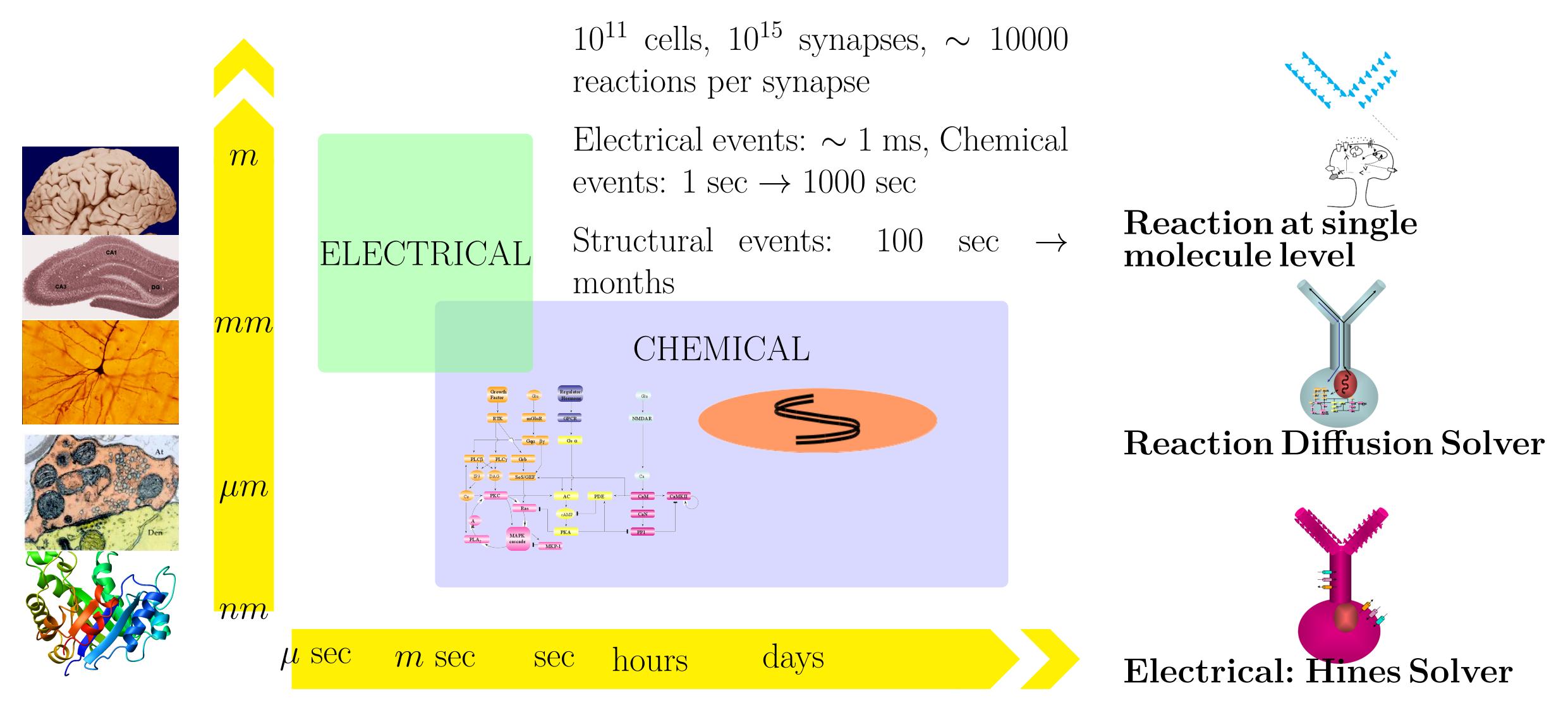


Modelling Memory Across Scales

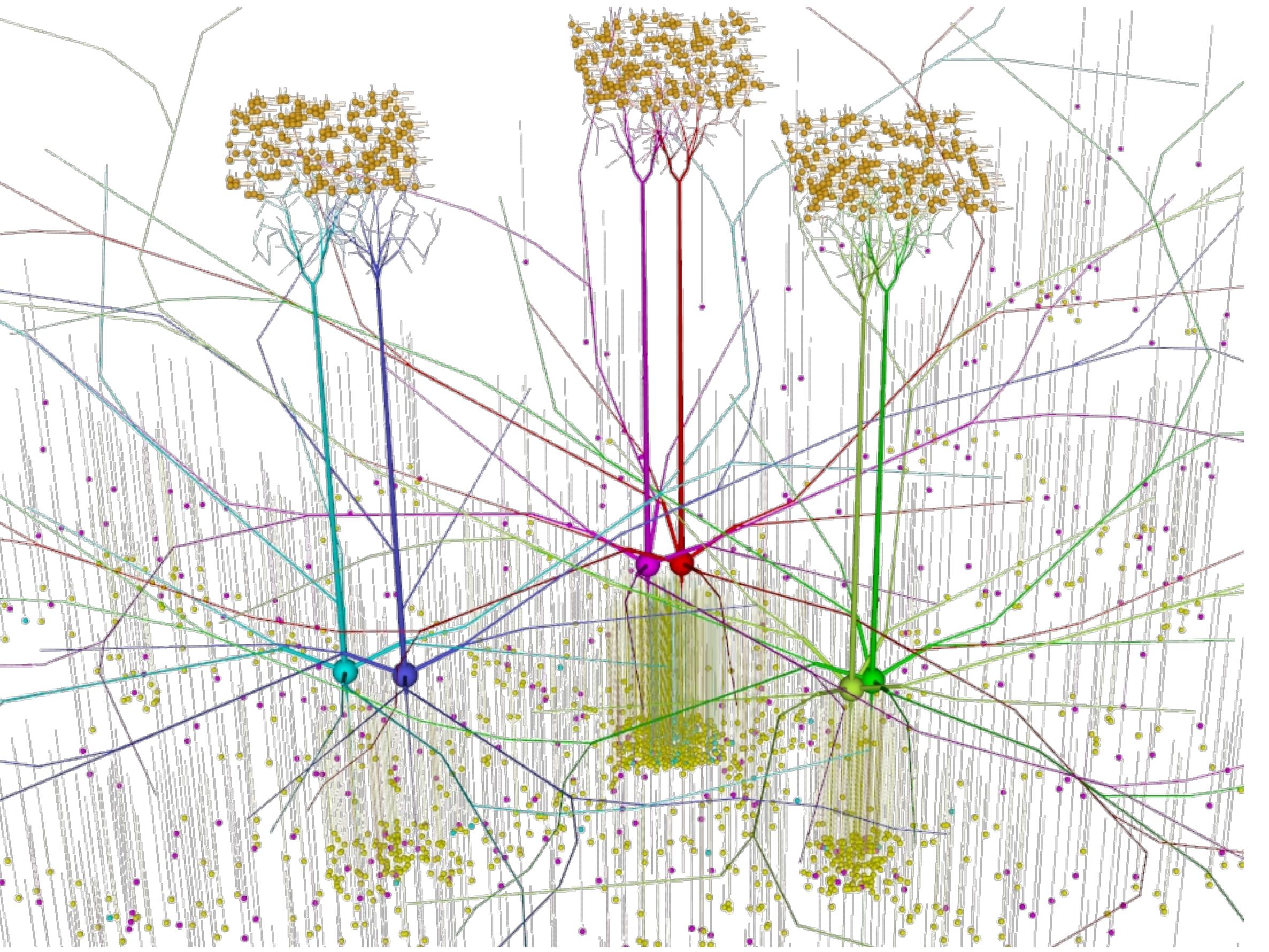
Subhasis Ray, Harsha Rani, Aditya Gilra, Sahil Moza, Aviral Goel, Dilawar Singh, Upinder Bhalla

1. Why Multiscale?

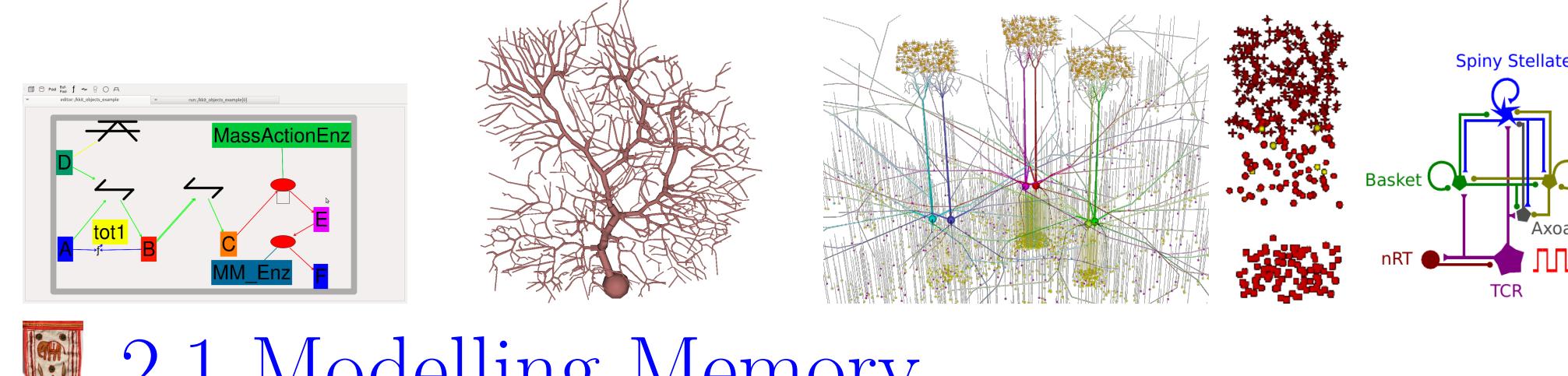
- Memory and plasticity involve brain mechanisms from molecular scale to enormous networks.
- We have developed MOOSE: the Multiscale Object Oriented Simulation Environment, to model plasticity and brain computation across scales.



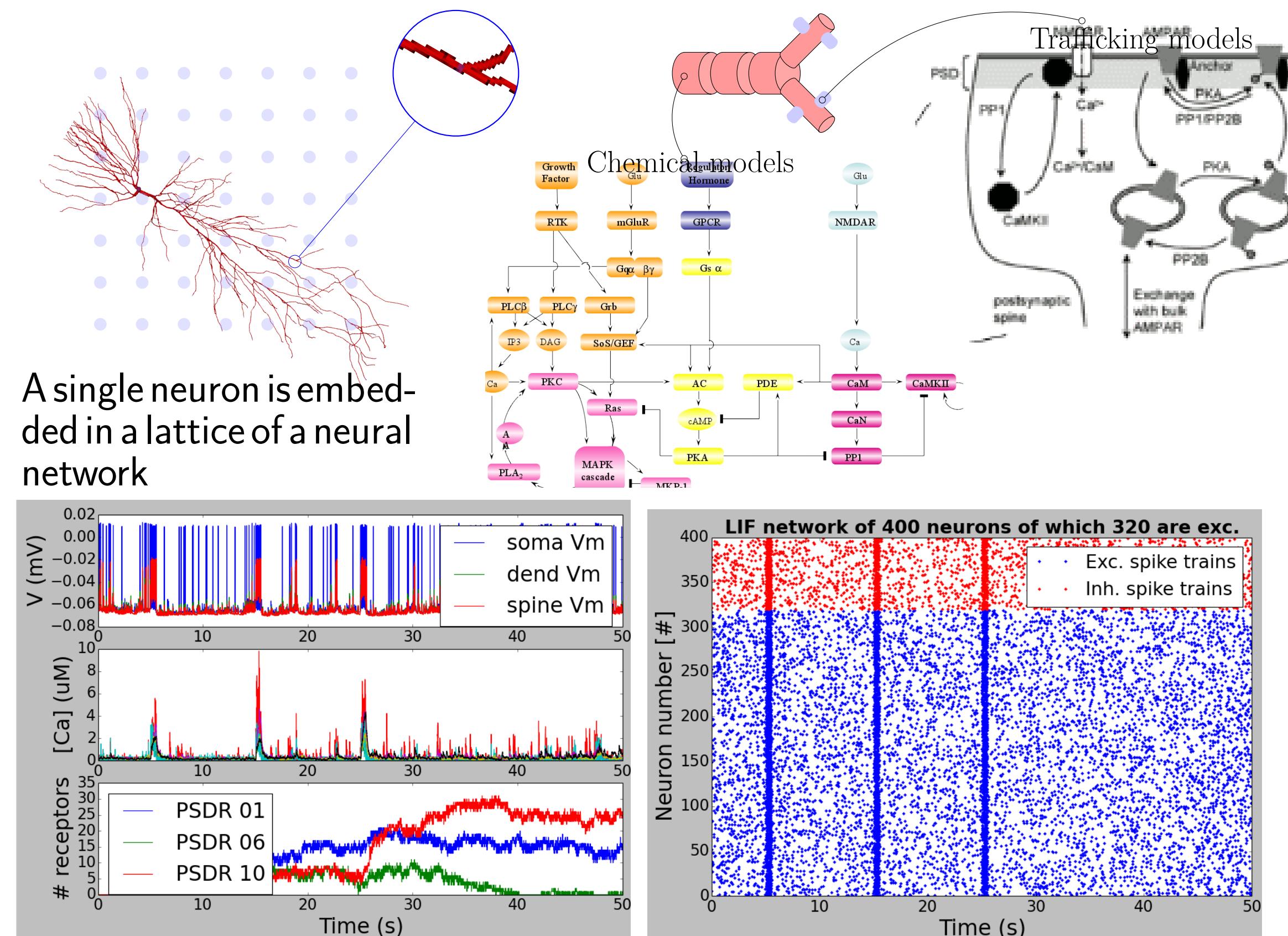
2.2 Modelling Olfactory Bulb



2. Some projects using MOOSE

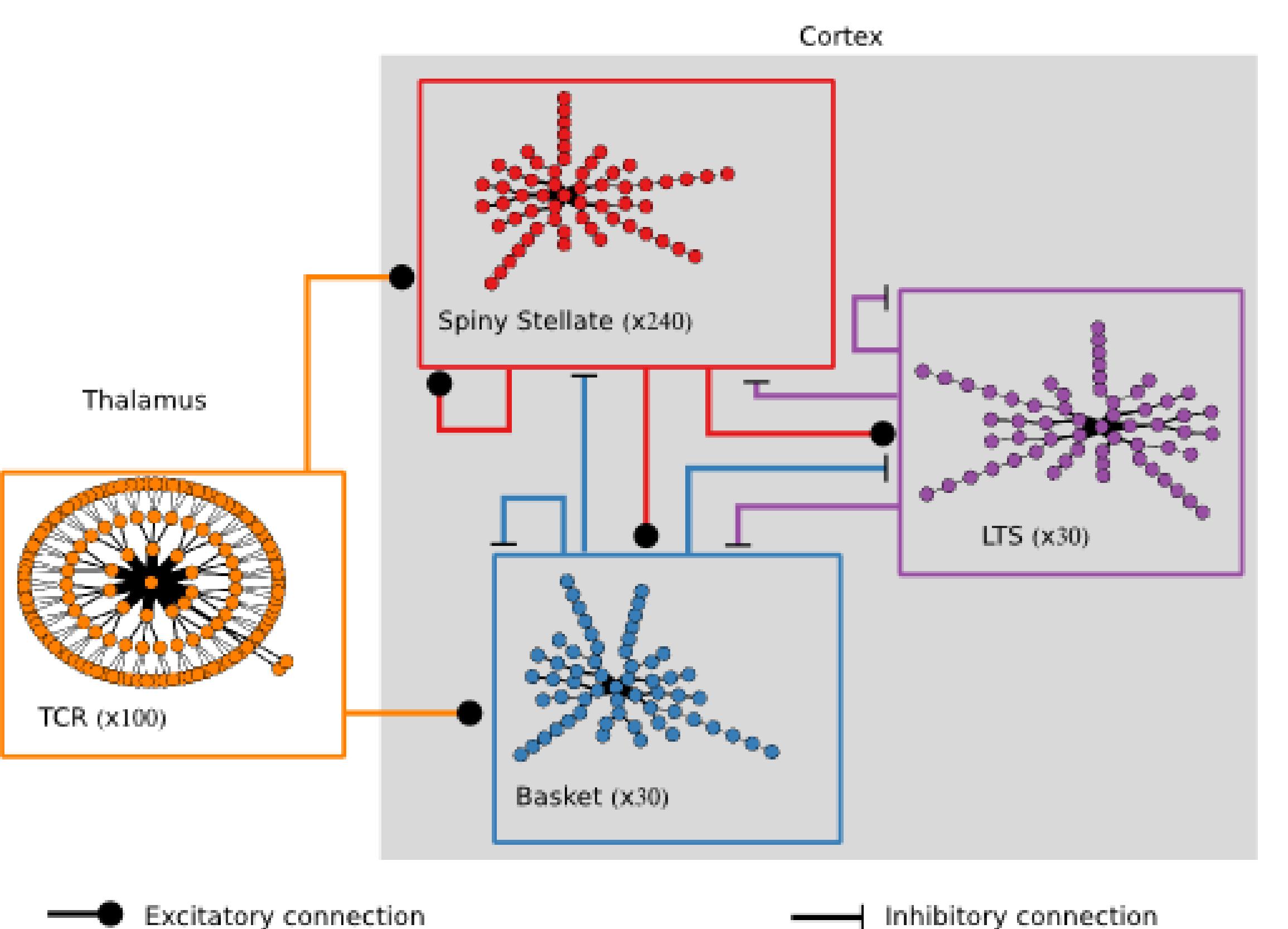


2.1 Modelling Memory

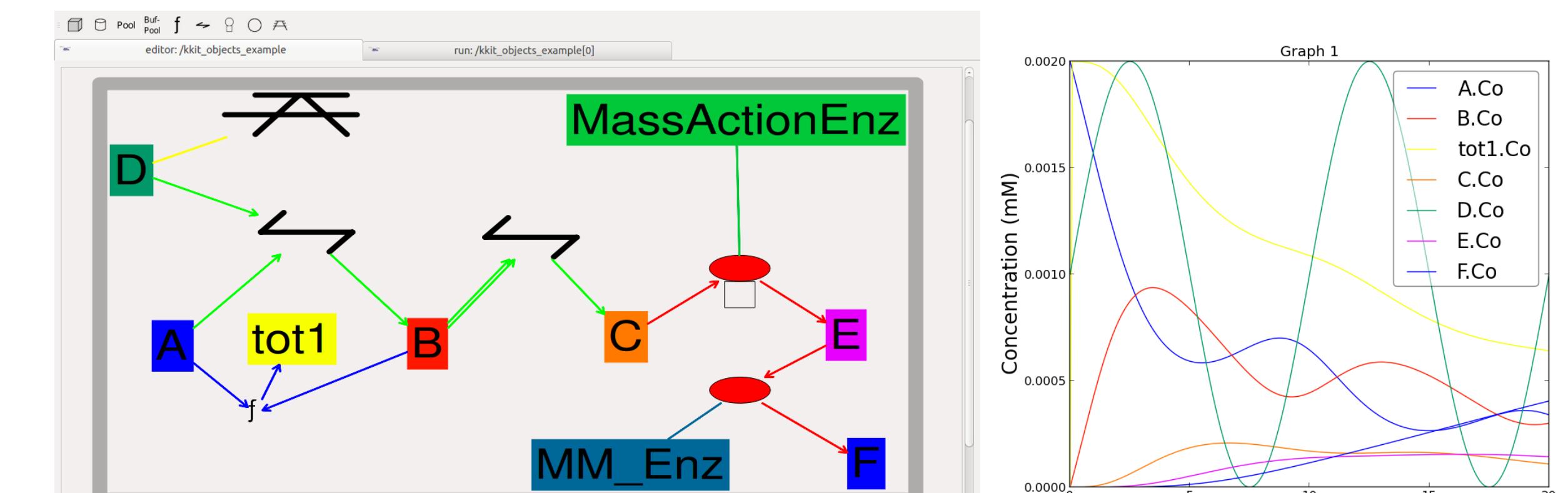


Network coding and computation in olfaction and somatosensory cortex. It explains linear coding and phase-decorrelation and predicts connectivity, lateral dendrite output structure.

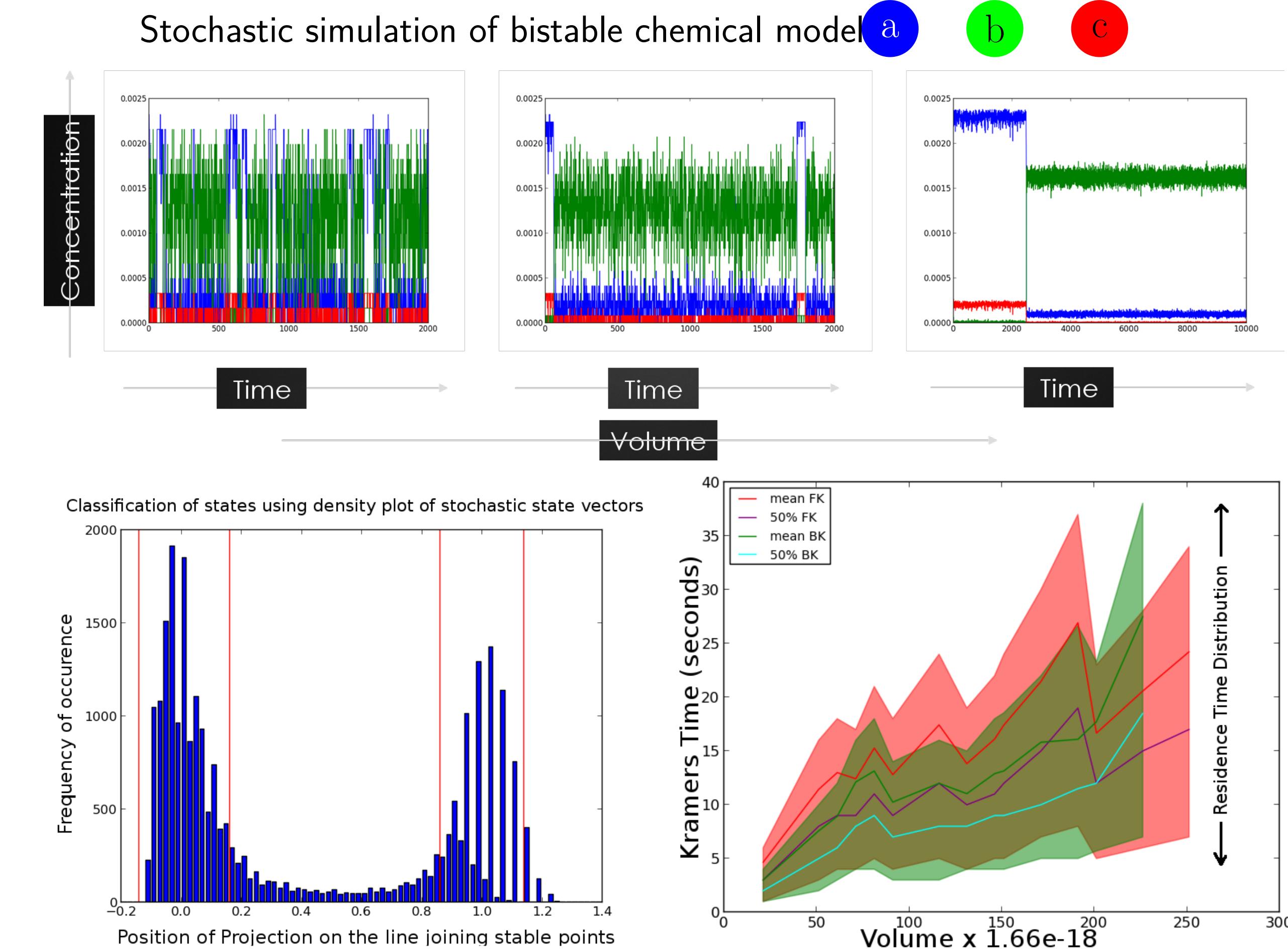
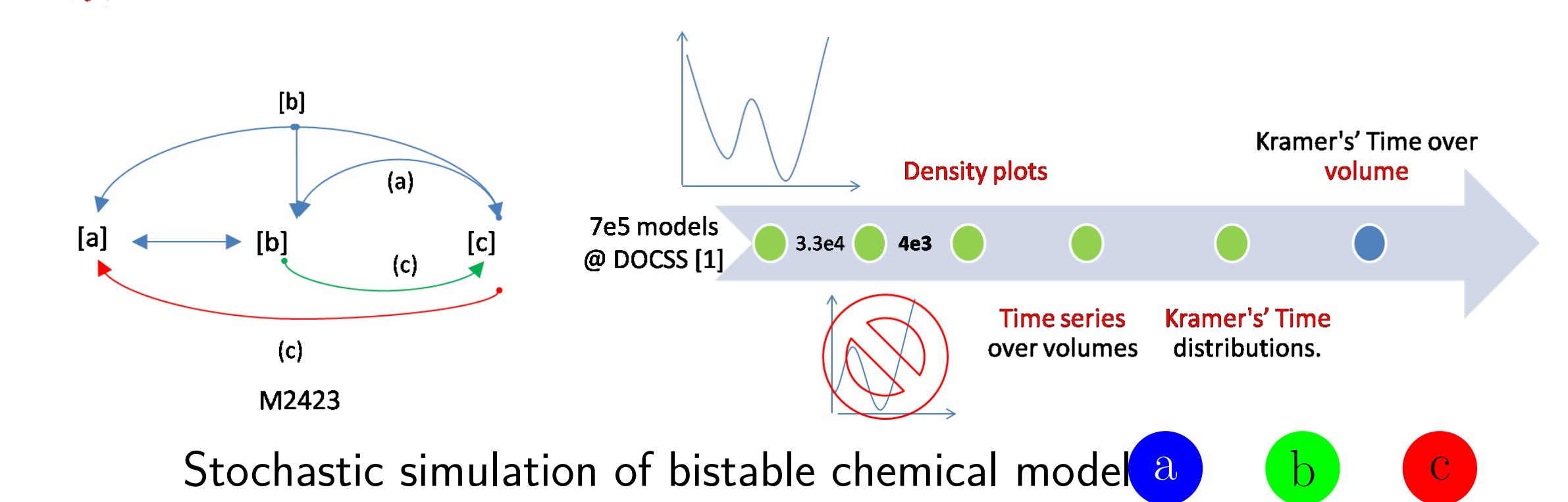
2.3 Modelling Cortex



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*.