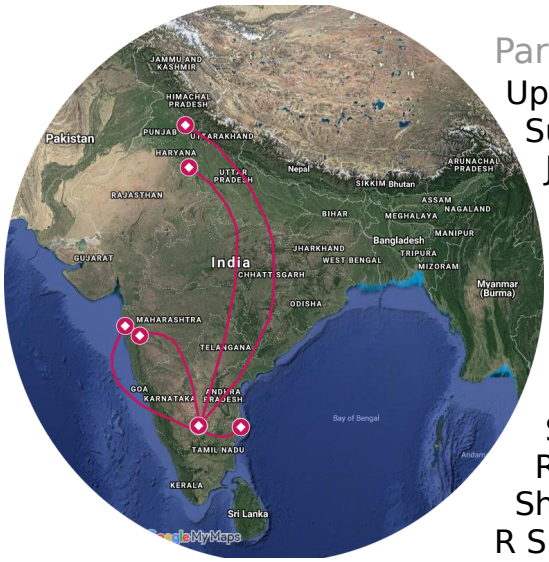
NEWSLETTER
OpenNeuroSig Consortium
Volume 1, Issue 4, Page 1 *Date: 03 May 2019*

Highlights...

- Grants application opened for consortium projects.
- Outreach efforts pharma companies.
- Decoding synapses: One "nanostep" at a time by Dr. Deepak K. Nair



Participating labs:
Upinder Bhalla, NCBS
Suhita Nadkarni, IISER Pune
James Chellaiah, JNCASR
Aditi Bhattacharya, InStem
Sayak Mukherjee, IBAB
Rohit Manchanda, IITB
Sourav Bannerjee, NBRC
Raghu Padinjat, NCBS
Deepak Nair, IISc
Srinivasa Chakravarthy, IITM
Rishikesh Narayanan, IISc
Shailesh Appukuttan, CNRS
R Srivatsan, IBAB

General Consortium News

* "Team Science Grant" from Wellcome-DBT alliance will start accepting application from May 16th 2019.

Members are encouraged to go through the information available on the website. https://www.indiaalliance.org/Team-Science-Grants

These grants may be suitable for some of the more active project themes in the consortium, some of which are listed in the next section.

* In a boost to outreach efforts, colleagues at IBAB have approached about 10 pharma companies for data and collaboration.

* An abstract on the Consortium has been submitted to the upcoming Neuroinformatics conference in September in Warsaw.

List of proposed projects

Several projects were proposed during the last consortium meeting:

- Postsynaptic activity-driven protein synthesis
- Synaptic plasticity induction and maintenance
- Astrocytes
- Stochasticity of molecular mechanisms looking into localization, organisation and electrical transmission
- Presynaptic signalling
- Neuromodulation

Some of members have updated what aspect of the project they would like to contribute. Others are requested to do so here.

Updates on Websites

The consortium website http://findsim.ncbs.res.in/findsimweb/ is taking shape.

The Newsletters are simulataneously uploaded to to the website under the "**NewsLetter**" section, as and when they are released. The previous newsletters can be found in the Archives.

We would like to finalize a logo and name for the consortium. Therefore, we request members to come up with suggestions/ ideas for the same. Some suggestions for name are:

NeurOSimST (Neural Open Source simulation for Signal Transduction) suggested by Dr. Aditi

SANKET (Signaling And Neurophysiology Knowledge-resource for Experiments and Theory) suggested by Dr. Bhalla which means "Signal" in Sanskrit.

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Work from participating labs

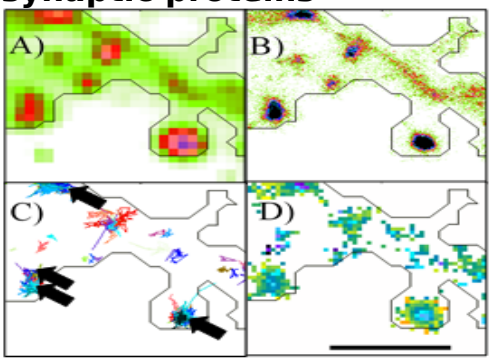
Understanding synapses and how the cells in brain process and transfer information is still not very well understood.
This demands the integration of information flow across many orders of magnitude.
Dr Deepak Nair at the Nano-organization lab at IISC, works on the finer levels of this spectrum.

He studies how a single synapse processes information, in real-time, at the resolution of molecules.

The major focus of their research is on glutamatergic excitatory synapses, which typically occur on spines.. The morphology of the spines is correlated with the efficiency of information transfer which in turn depends on the distribution of molecules involved in orchestrating this flow of information. This process is coordinated by molecules assembling and disassembling in real-time to adapt synaptic efficacy so as to pass the necessary information.
The lab investigates this localization and trafficking of single molecules/particles of interest on the time-scale of milliseconds to seconds.

Dr. Nair uses single particle tracking in combination with recently developed super-resolution imaging paradigms to perform routine imaging at a resolution of 10-100nm which links the ultrastructure to functional association molecules to subsynaptic compartments. Further, they can manipulate single synapses using optogenetic approaches or uncaging of chemicals like neurotransmitters or second messengers. This facilitates a close examination of he properties of isolated synaptic events at the spatio temporal resolution appropriate for synaptic function. In short, experimental approaches in their lab integrate both “biochemistry at nanoscale” and “diffusional models of chemical reactions”.

Nanoscale imaging along with single particle tracking reveals the molecular organization of synaptic proteins



A) Epifluore scence image of dendritic shaft of neurons expressing protein of interest fused to mEOS fluorescence molecule. **B**) Corresponding super resolution image. **C**) Isolated representative trajectories of single :mEOS molecules tagged to the protein, arrows indicates strong zones of confinement of the protein. **D**) Nanoscale mobility maps shows Nanodomains are formed by strong confinement. Scale bar indicate 2µm.

Dr. Deepak Nair says,” We are happy to be part of the consortium where we can interact with people with differing backgrounds. We believe that such holistic approaches of acquiring exhaustive descriptive information and utilizing realistic data sets to mimic insilico studies will bridge between different spatial and temporal scales in the brain and thus enable us to understand this complex brain one “nanostep” at a time.”