CNS
SYMPOSIUM
CENTRE FOR NEUROSCIENCE

CNS Annual Symposium

11th September, 2026

Teams link for the Symposium

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CNS SYMPOSIUM '26

11.09.26-Schedule

Time	Event	Speaker	Title
8:45 to 9:00 AM	Welcome Address	Prof. Supratim Ray	-
9:00 to 9:15 AM	Talk 1	Kamal Kishore	Characterizing the role of PUF-9 RNA-binding protein in Caenorhabditis elegans locomotory behavior
9:15 to 9:30 AM	Talk 2	Sini Simon M	Encoding of social variables and inter-brain dynamics during simultaneous recordings from two socially interacting monkeys
9:30 to 10:30 AM	**Keynote Address**	Prof. Sumantra Chattarji NCBS; CHINTA.	**Tiptoeing into Translational Neuroscience in India:** A Small Example
10:30 to 11:00 AM	Coffee/Tea		
11:00 to 11:15 AM	Talk 3	Mainak Biswas	Rescuing catastrophic failures during agentic referral of domain-shifted medical images
11:15 to 11:30 AM	Talk 4	Yatika	Dopamine Receptor 1-Specific Modulation of Cingulate Cortex in Neuropathic Pain
11:30 to 11:45 AM	Talk 5	Deepak Raya	Flexible remapping of Visual working memory across gaze shifts
11:45 to 12:00 PM	Talk 6	Prankur Saxena	Role of contingency in reward-emotion interactions in the human brain.
12:00 to 1:00 PM	**Poster session 1**		
1:00 to 2:00 PM	Lunch Break		
2:00 TO 3:00 PM	**Poster session 2**		
3:00 to 3:15 PM	Talk 7	Sharanya H	Elucidating the role of FLP-12 in the regulation of amplitude of body bends of Caenorhabditis elegans
3:15 to 3:30 PM	Talk 8	Shashank Gouroju	Studying Contextual Influences in Macaque Primary Visual Cortex
3:30 to 3:45 PM	Talk 9	Kalpajyoti Hazarika	From Readiness Potential to Motor Unit Activity: Tracking Voluntary Action Across Brain and Body
3:45 to 4:00 PM	Talk 10	Atharva Modi	Neural Mechanisms of Trial-and-Error Motor Learning
4:00 to 4:15 PM	Coffee/Tea		
4:15 to 5:15PM	**Panel Discussion**	**Moderator:** Prof. Deepak Nair	**New Directions in Neuroscience: Techniques, Transitions, and Trends.** **PANELISTS** • Dr. Abhishek Bhattacharya (NCBS) • Prof. Anindya Sinha (NIAS) • Dr. Bhanu Priya Somashekar (APU) • Dr. Sarthak Chandra (TIFR) • Prof. Sumantra Chattarji (NCBS & CHINTA)
5:15 to 5:30 PM	Prize Distribution and Closing Remarks		
5:30 PM	High Tea & Photo Session		

Oral Presentations

Characterizing the role of PUF-9 RNA-binding protein in Caenorhabditis elegans locomotory behavior

Presenter: Kamal Kishore

Supervisor: Dr. Kavita Babu

ABSTRACT:

Gene expression regulation is crucial for cellular development and maintenance, and RNA-binding proteins(RBPs) are key regulators at the post-transcriptional level, modulating RNA stability, localization, and translation. The Pumilio family of RBPs are highly conserved in their structure across eukaryotes and are typically known to bind to the 3' untranslated region(3' UTR) of their target mRNA. While Pumilio proteins are well characterized for their roles in germ cell development, germline proliferation, and oocyte maturation, their neuronal functions remain poorly understood. C. elegans encodes 11 PUF proteins, including puf-9, expressed broadly in muscle, hypodermis, and neurons; however, its neuronal functions are not well understood

Here, we have shown that puf-9 mutants exhibit defective locomotion, with uncoordinated movement. puf-9 mutants show a reduced mean amplitude compared to the wild type; this defect is fully rescued by exogenous expression of PUF-9 protein under its own promoter, confirming the role of PUF-9 in locomotory control. Pan-neuronal expression of PUF-9 similarly rescues the defect, establishing its neuronal nature. Furthermore, cell-type-specific rescue in cholinergic, GABAergic, serotonergic, and glutamatergic neurons showed that only glutamatergic expression of PUF-9 restores normal movement, indicating that glutamatergic neurons are the primary site of PUF-9 function in regulating movement.

Additionally, whole-organism RNA-seq analysis of puf-9 mutants identified >500 genes upregulated and >100 genes downregulated [padj < 0.05, |log2FC| > 1] compared with the wild type. To further narrow down the direct binding partner, RIP-seq is underway.

Together, these findings establish that PUF-9 acts in glutamatergic neurons to regulate locomotion in C. elegans, providing the first evidence for the locomotory role of the PUF-9 RNA-binding protein.

Encoding of social variables and inter-brain dynamics during simultaneous recordings from two socially interacting monkeys

Presenter: Sini Simon M

Supervisor: Dr. SP Arun

ABSTRACT:

Most primates live in groups and are thus highly social. They interact with each other, keep track of social favours, know the hierarchy within the social group, and modulate their responses or actions according to the social context. Although social interactions are prevalent, their neural basis is not well understood.

To understand the neural basis of social interactions, we did simultaneous wireless recordings from two freely moving monkeys as they interacted in a naturalistic setting. Each monkey was implanted with 256 electrodes, spanning the inferior temporal cortex (IT) and the ventral premotor/ventrolateral prefrontal (PMv/vlPFC) cortex. During the social session, they mostly groomed each other, interspersed with bouts of no interaction. In addition to this, we also recorded neural data while each monkey passively viewed its own images, the partner monkey's images, or an unrelated monkey's images, to see if we could decode the partner's identity in the social session, using a linear decoder trained on the neural activity from the passive fixation task. We show that 1) monkeys spent almost similar duration of time grooming each other, showing grooming reciprocity, 2) neurons in the IT cortex track the social favor signal defined as the difference of the cumulative time spend in grooming the partner and the cumulative time spend in receiving the grooming from the partner during the session suggestive of neural correlates of grooming reciprocity, 3) neurons in all the brain regions encode the grooming state (giving groom/ receiving groom/ no grooming), 4) IT neurons encode partner identity irrespective of groom state 5) groomer monkey's brain activity is better predicted by the receiver monkey's joint positions as well as its brain activity, suggesting that groom receiver drove the grooming interaction.

Overall, we show reliable encoding of social variables and inter-brain coupling during social interactions.

Rescuing catastrophic failures during agentic referral of domain-shifted medical images

Presenter: Mainak Biswas

Supervisor: Dr. Sridharan Devarajan

ABSTRACT:

Deep learning models in the real world need robust awareness of their predictive uncertainties. When tested with out-of-domain data, they should refrain from making predictions on uncertain samples and instead refer them to experts. Using medical data with varying demographics, tissue types, or instrumentation (``covariate shift''), we show that entropy-based uncertainty estimates are unreliable for selective referral: they produce inordinate performance degradation (~50%) at high referral rates. Even state-of-the-art foundation models based on self-supervision (e.g., REMEDIS) or adversarial alignment (e.g., DANN) fail to rescue these vulnerabilities. To address this, we introduce Domain-Aware Recognition-Parameterized Probabilistic Models (DA-RPMs) for domain-general classification. DA-RPMs substantially outperform state-of-the-art models across diverse domains (retinopathy, histopathology, pulmonology, and dermatology) while generating discrete, interpretable latent representations. Additionally, their sample likelihoods robustly identify semantically shifted outliers. Our approach overcomes critical referral challenges in medical imaging, significantly enhancing the reliability and safety of AI-assisted clinical diagnosis.

Dopamine Receptor 1-Specific Modulation of Cingulate Cortex in Neuropathic Pain

Presenter: Yatika

Supervisor: Dr. Arnab Barik

ABSTRACT:

Chronic neuropathic pain affects around 10% of the global population and arises from disorders of the peripheral or central nervous system. Patients often perceive innocuous stimuli as painful, resulting in persistent discomfort, anxiety, and mood disorders. Current first-line treatments, including antidepressants, topical agents, and gabapentinoids, provide only partial relief and have limited efficacy against both sensory and affective symptoms. Pain processing involves both opioidergic and non-opioidergic circuits. While the PAG–RVM pathway is central to opioid-mediated pain control, long-term opioid therapy is limited by tolerance, dependence, and adverse effects. This has intensified efforts to identify non-opioid targets within cortical pain-processing regions such as the anterior cingulate cortex (ACC). Although maladaptive cortical plasticity is known to contribute to chronic pain, the cellular mechanisms remain poorly understood. Here, I investigated how mesocortical dopamine signaling regulates dopamine receptor 1 (D1R)-expressing ACC neurons (ACCD1R) during neuropathic pain.

In Aim 1, neuropathic pain was induced using the spared nerve injury (SNI) model, and the D1R agonist SKF83822 was infused into the ACC. Activation of D1Rs increased mechanical thresholds and reduced anxiety-like behavior in both naïve and SNI mice, indicating that ACC D1R signaling suppresses sensory and affective pain responses. In Aim 2, to directly examine the roles of ACCD1R neurons, I used chemogenetic approaches. Activation of ACCD1R neurons with hM3D(Gq) DREADDs increased mechanical thresholds, reduced anxiety-like behavior, and promoted positive valence, whereas constitutive inhibition using Kir2.1 produced the opposite effects, even in the absence of nerve injury. These findings establish ACCD1R neurons as key regulators of pain processing. While selective optogenetic activation of D1R-expressing inhibitory neurons increased mechanical thresholds, demonstrating that inhibitory ACCD1R neurons contribute substantially to pain suppression. Finally, in Aim 3, whole-cell patch-clamp recordings revealed that neuropathy reduced the excitability of inhibitory ACCD1R neurons while making the excitatory ACCD1R neurons hyperexcitible. D1R agonist application restored inhibitory neuron firing and reduced the excitability of excitatory neurons.

Together, these pharmacological, chemogenetic, optogenetic, and electrophysiological studies identify dopaminergic regulation of ACCD1R neurons as a critical mechanism in chronic pain and highlight ACC inhibitory circuits as promising non-opioid therapeutic targets.

Flexible remapping of Visual working memory across gaze shifts

Presenter: Deepak Raya

Supervisor: Dr. Sridharan Devarajan

ABSTRACT:

Visual working memory (VWM) allows us to retain the identity and location of fleetingly perceived objects even after a gaze shift, but the reference frame underlying this stability remains unresolved. Prior work supports maintenance in a retinotopic (gaze-centered) reference frame, in the hemifield contralateral to the memorandum. By contrast emerging evidence indicates that interhemispheric transfer of the memory trace occurs following eye movements, suggesting a spatiotopic (world-centered) reference frame. Here, we tested whether VWM is inherently spatiotopic or flexibly adapts to task demands using a novel VWM task that encouraged maintenance in, alternatively, spatiotopic and retinotopic reference frames. Multivariate decoding of memorandum features from human electrophysiology (EEG) revealed a transfer of mnemonic representations across hemifields, selectively in the spatiotopic context. This transfer was accompanied by increased interhemispheric high-theta (5–8 Hz) coherence. Critically, VWM precision (psychometric slope) improved with stronger transfer, in the spatiotopic condition alone. Together, these findings show that VWM representations are flexibly reconfigured based on task demands and identify neural mechanisms that putatively link gaze shifts and VWM.

Role of contingency in reward-emotion interactions in the human brain.

Presenter: Prankur Saxena

Supervisor: Dr. Srikanth Padmala

ABSTRACT:

Reward motivation is known to interact with emotional processing, but recent behavioral work suggests this interaction depends on contingency which determines how reward outcome is tied to task performance, rather than expected value of reward alone. It remains unknown if the effects of contingency on the reward-emotion interaction arise at the cue processing itself or, emerge only once the emotional information is encountered. We used fMRI (N = 58) in a 2 (reward: high/low) × 2 (contingency: contingent/noncontingent) × 3 (emotion: positive/negative/neutral) design, modelling the events using a saturated model that accounted for the entire duration of cue, delay and task. At the task stage, we did not observe reliable three-way Reward × Contingency × Emotion interactions, either behaviorally or neurally, however, several clusters in the visual processing regions showed reward-emotions interaction at the task stage. A brain-behavior correlation further showed that striatal response was positively associated with the magnitude of individuals' behavioral Reward × Contingency interaction, linking anticipatory neural responses to the behavioral outcome of contingent high-reward cues. Ongoing analyses, including beta-series connectivity between cue-phase regions and task-phase amygdala and task-phase psychophysiological interaction analyses, will further test whether this anticipatory signal functionally shapes downstream emotional processing.

Elucidating the role of FLP-12 in the regulation of amplitude of body bends of Caenorhabditis elegans

Presenter: Sharanya H

Supervisor: Dr. Kavita Babu

ABSTRACT:

Neurons can communicate with each other via neuropeptides, in addition to neurotransmitters. Neuropeptides modulate behaviour by binding to G protein-coupled receptors (GPCRs) and causing gene expression changes. They function at a larger spatio-temporal range than neurotransmitters. Some neuropeptides have the capacity to interact with multiple receptors, and conversely, some receptors are promiscuous. Due to the complexity of their actions, it is difficult to study their functions in organisms with intricate nervous systems. C. elegans is an excellent model system to study the functions of neuropeptides, especially in the context of locomotion. There are three major families of neuropeptides in C. elegans: FMRF-like neuropeptides (FLPs), Neuropeptide-like neuropeptides (NLPs) and Insulin-like neuropeptides (ILPs).

C. elegans moves by generating sinusoidal dorso-ventral undulations along its body. Regulation of the amplitude of body bends is essential for C. elegans to efficiently explore its environment, forage and escape predators. While the synaptic connections are known for the motor circuits involved in the regulation of the sinusoidal undulations, much is unknown about their functional dynamics.

We performed a preliminary screen of neuropeptide mutant hermaphrodite C. elegans for defects in locomotion. We observed that mutants of an FMRF-amide like neuropeptide, flp-12, exhibit an increase in amplitude of body bends. This defect was partially rescued by expressing FLP-12 under its endogenous promoter in the mutant background. According to the C. elegans Neuronal Gene Expression Map & Network (CeNGEN) database, FLP-12 is highly expressed in SMB neurons. SMB neurons have been previously shown to regulate the amplitude of body bends. A recent study that mapped peptide-GPCR interactions has shown that FLP-12 may bind to FRPR-8, DMSR-1, DMSR-7, DMSR-8 and EGL-6. Consistent with this study, we also found that frpr-8 mutants show an increased amplitude of body bends similar to flp-12 mutants. We generated flp-12;frpr-8 double mutants and observed that they phenocopied the single mutants. These observations lead to the formulation of the hypothesis that FLP-12 is released by SMB neurons and acts through FRPR-8 to control the amplitude of body bends. To test this hypothesis, we will elucidate the neural circuit through which FLP-12 functions to regulate the amplitude of sinusoidal body undulations and study its effect on the neuromuscular junction. The results obtained may provide interesting mechanistic insights into how neuropeptides control behaviour.

Studying Contextual Influences in Macaque Primary Visual Cortex

Presenter: Shashank Gouroju

Supervisor: Dr. Supratim Ray

ABSTRACT:

Context refers to the surrounding information that influences our perception. It can include spatial or temporal information, as well as prior knowledge and experience. Identical sensory stimuli in different contexts can evoke distinct neural responses, leading to different perceptual experiences. In some cases, contextual influences can distort our perception of reality, giving rise to what are known as Illusions.

Visual illusions are more compelling because vision often dominates our other senses. One notable example is the well-known color illusion by Akiyoshi Kitaoka, in which an object (strawberry/tomato) appears reddish in the presence of an opponent (cyan) surround, even though there are no red pixels in the image. Where in the visual pathway does sensitivity to illusory colors appear remains unknown. Since gamma oscillations (30-70 Hz) in primate primary visual cortex (V1) are highly color-sensitive, we tested whether gamma in V1 could be induced by illusory colors.

We produced images such that the color inside the receptive field (RFs) of V1 sites were always gray but appeared of different colors depending on the surround. We found that the induced gamma was not tuned to the illusory color but the surround (opponent) color. Separate experiments revealed that surround color influenced both alpha and gamma rhythms even from several degrees away from the RF center, but it was due to volume conduction rather than generated within the cortical area. These results suggest that V1 does not respond to illusory colors

From Readiness Potential to Motor Unit Activity: Tracking Voluntary Action Across Brain and Body

Presenter: Kalpajyoti Hazarika

Supervisor: Dr. Aditya Murthy

ABSTRACT:

The distinction between a wink and a blink, and more broadly between voluntary and involuntary movement, is central to legal, ethical, and philosophical accounts of human action. This distinction depends on the concept of agency, which is closely linked to conscious awareness of the intention to act and the predicted consequences of action. Classical studies of self-initiated movement, including Libet's "free will" task, have associated the readiness potential (RP) with volitional motor preparation, suggesting a causal sequence from RP onset to the conscious urge to move, known as W time, and finally to movement execution. However, Schurger and colleagues proposed that the RP may instead reflect stochastic neural fluctuations accumulating toward a decision threshold, raising important questions about what the RP represents.

To investigate the neural, peripheral, and behavioral signatures of movement-related decisions, we designed two modified versions of the Libet task involving reaching movements. In the self-initiated task, participants reached toward a target while monitoring a clock and reported the time of their conscious urge to move. In the reactive control task, participants reached in response to an unpredictable visual cue and reported the cue time. This design allowed us to compare internally generated and externally triggered movement preparation while recording cortical activity, motor unit activity from EMG, and movement kinematics.

Our results showed that the RP differed between self-initiated and reactive movements in both slope and amplitude. This suggests that the RP is sensitive to the mode of movement preparation and may reflect internally driven urgency accumulation, which is reduced when movement is triggered by an unpredictable external cue. We then examined whether these decision-related differences were also reflected in the peripheral motor system by analyzing motor units with different recruitment thresholds. Low-threshold motor units showed earlier spiking onset during self-initiated movements than during reactive movements, suggesting gradual peripheral preparation before self-initiated action. In contrast, firing-rate slopes were higher during reactive movements, consistent with more rapid externally driven recruitment. Higher baseline motor unit activity during self-initiated movements may further reflect increased internal commitment or readiness to act.

Kinematic analyses further showed that self-initiated movements were associated with greater motor control during execution compared with reactive movements. This was reflected in differences in the velocity profile and reduced variability in movement trajectories, suggesting that internally prepared actions may allow more stable and controlled movement execution than externally triggered actions.

Together, these findings suggest that movement-related decisions are computed online across cortical and spinal levels. Rather than reflecting a purely cortical preparatory process, voluntary action may emerge from coordinated brain–body dynamics that shape conscious intention, peripheral motor readiness, and movement execution.

Neural Mechanisms of Trial-and-Error Motor Learning

Presenter: Atharva Modi

Supervisor: Dr. Ashesh Dhawale

ABSTRACT:

Acquiring new motor skills, such as a volleyball serve, relies on trial-and-error learning driven by simple feedback - success or failure. While prior studies have largely focused on discrete action selection (e.g., choosing between an underarm or overarm serve), far less is known about how the brain adapts continuous movement features such as angle or spin. Learning such kinematic parameters requires exploration of vast motor spaces, yet the underlying neural mechanisms
remain unclear. We investigated the respective contributions of the basal ganglia (BG) and motor cortex (MC) to kinematic trial-and-error learning. Classical views propose that the BG learn which action to select, whereas MC learns movement kinematics. However, these roles have not been rigorously tested in a task that isolates kinematic adaptation from action selection. To address this gap, we developed a novel task in which rats learned to adapt the angle of joystick-pressing
movements to obtain water rewards. Lesions of the sensorimotor striatum (DLS) abolished kinematic adaptation, whereas MC lesions did not. If DLS indeed mediates kinematic learning, we hypothesized that it should receive reinforcement signals. But prior studies suggest dopamine in DLS primarily encodes movement. Thus, we measured dopamine release using fibre photometry and found that it encoded both movement and reward. Importantly, reward-related
signals scaled with reward rate, consistent with reward prediction error encoding. Lesioning dopamine terminals in the DLS using 6-OHDA abolished learning establishing a necessity of dopamine in the DLS for the process. Together, our results redefine the roles of BG and MC in motor learning and suggest that dopamine in DLS provides a teaching signal for kinematic adaptation.

Poster Presentations

S. No.	Presenter	Title of Poster
1	Vaishnavi Mohite	Measuring the full spectrum of face perception abilities in India through the Indian Face Memory Test (IFMT)
2	Sailesh S	Targeted inhibition of hippocampal pyramidal neuron slow afterhyperpolarization for ameliorating memory deficit in aging
3	Vinod Kumar	How Meditation Changes Brain & Body: Investigating the Effects of Meditation on the Functional Connectivity and Physiology
4	Anusha Rastogi	In(scent)sitive Worms: Characterizing the role of CLC-3 in olfaction in Caenorhabditis elegans
5	Mousmi Rani	Parabrachial-thalamic circuitry driving maladaptive plasticity for sensory responses to cold pain
6	Kalyanbrata Chandra	Voluntary alpha lateralization does not obligatorily shift covert spatial attention
7	Sreenivas Bhaskara	Design, Fabrication, and Validation of a Surface Neural Implant for Brain Stimulation in Rat Models
8	Bapun Giri	Neural basis of meta-learning in the prefrontal cortex
9	Sandhya G	Dual Burden of Kidney Disease and Cognitive Impairment in the Longitudinal Aging Study in India-Diagnostic Assessment of Dementia-Cohort
10	Surbhi Munda	Do monkey IT/PFC neurons show a Bouba-Kiki effect?
11	Eshita Bansal	Neural correlates of Global and Local processing of visual stimuli in the high-level visual cortex of monkeys
12	Swikriti Saran Singh	Finger-level, closed-loop motor decoding with low-density EEG in BCI-naive users
13	Chintada Guna Sai	Multi-Electrode Platform for Recording Neural Activity at High Spatial Resolution
14	Arvindhane M	Proactive control of emotional conflict using congruency pre-cues: Behavioral and Pupillometric investigation
15	Dwaiti Roy	Prevalence of Subjective Cognitive Decline and Mild Cognitive Impairment in Rural Versus Urban Population: Insights from India
16	Meera Krishnan E R	Investigating the Amyloid Precursor Protein cleaving secretase machinery as a structural risk factor for the onset of Alzheimer's Disease
17	Gargi Mandal	Flexible polymeric pillars fine tune dendritic morphology and outgrowth in primary neurons