

The Institute of Mathematical Sciences, Chennai



Quarterly Report

April - June 2021



Speaker: Prof Jean-Marie Lehn, Nobel Laureate, University of Strasbourg, France.

HBNI Foundation Day: J. B. Joshi Research Foundation Endowment Lecture

3. Wednesday, April 21 2021, 17:30 - 18:30 (IMSc Webinar-Special Lecture)

Recent Developments in the Mathematics of Neural Nets

Speaker: Anirbit Mukherjee University of Pennsylvania

zoom.us/j/91782375389?pwd=aUo4UWZKZjh1SlBYWkV2QlBnY3VyZz09

4. Friday, June 18 2021, 16:30 - 18:30 (IMSc Webinar-Physics Colloquium)

The hadronic vacuum polarization from lattice QCD: contributions to the muon anomalous magnetic moment and to the running of electroweak couplings

Speaker: Marco Ce, CERN

The recent Fermilab experimental result, combined with the previous BNL one, confirms the ongoing four-sigma tension between the SM theory prediction of the anomalous magnetic moment ($g-2$) of the muon and the experimental value.

However, some lattice QCD calculations have produced results for the hadronic vacuum polarization (HVP) contribution to the muon $g-2$ that solve the discrepancy with the experiments without the need of BSM physics. If this is confirmed, a new tension would arise either with the hadronic cross-section at low energies or with global electroweak fits. Lattice QCD results for the HVP contribution to the running of the electroweak couplings can shed light on this possible tension.

Threads on Twitter:

Some of our events / research activities that received many likes from the public via twitter. Few are listed as below:

1. <https://twitter.com/IMScChennai/status/1407222655812395013>

Mini-symposium on "Looking back, looking forward", on the **Science of COVID19** (28th June, 2021).

IMSc has conducted mini-symposium "Looking back, looking forward", on 28th June 2021, presenting short talks and discussion on the science of **COVID19**, zoonotic diseases and

spillover, immune response, epidemiology, and variant tracking etc., Prof. Gautam I Menon, Ashoka University Sonipat[NCR]/IMSc Chennai, was the Moderator for this symposium.

Speakers: Uma Ramakrishnan (NCBS Bengaluru), Vineeta Bal (IISER Pune), Rajesh Sundaresan(IISc Bengaluru), Dhiraj Hazra(IMSc Chennai)Chitra Pattabiraman (NIMHANS Bengaluru) and Vinod Scaria(CSIR-IGIB Delhi).

2. <https://twitter.com/IMScChennai/status/1408034688241836033>

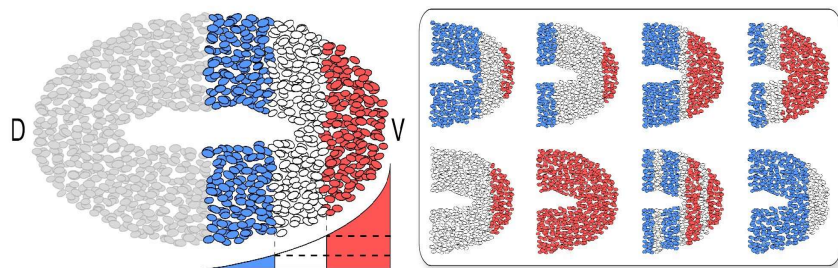
Intercellular signaling:

One of the publications by our member has received a tweet.

DOI:<https://doi.org/10.1103/PhysRevE.103.062409>

Development in multicellular organisms is marked by a high degree of spatial organization of the cells attaining distinct fates in the embryo. Recent experiments showing that suppression of intercellular interactions can alter the spatial patterns arising during development suggest that cell fates cannot be determined by the exclusive regulation of differential gene expression by morphogen gradients (the conventional view encapsulated in the French flag model).

Using a mathematical model that describes the receptor-ligand interaction between cells in close physical proximity, we show that such intercellular signaling can regulate the process of selective gene expression within each cell, allowing information from the cellular neighborhood to influence the process by which the thresholds of morphogen concentration that dictate cell fates adaptively emerge. This results in local modulations of the positional cues provided by the global field set up by the morphogen, allowing interaction-mediated self-organized pattern formation to complement boundary-organized mechanisms in the context of development.



DOI:<https://doi.org/10.1103/PhysRevE.103.062409>