Soumya Iyengar

Curriculum Vitae

Professor

National Brain Research Centre

Manesar –122052, Haryana

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DOB: March 25, 1968

Academic and Professional experience:

2016 – present	Professor, National Brain Research Centre, Manesar, Haryana
2011 – 2016	Additional Professor, National Brain Research Centre, Manesar, Haryana
2008 - 2011	Associate Professor, National Brain Research Centre, Manesar, Haryana
2003-2008	Assistant Professor, National Brain Research Centre, Manesar, Haryana

Research:

Project 1: Recent studies on the arrangements of neuron in the auditory cortex and fMRI studies in adult humans have revealed that the auditory cortex is subdivided into a number of distinct areas based on their cytoarchitecture, connections with other parts of the brain and their functions. Amongst these, the primary auditory area is involved in perceiving pure tones whereas the surrounding association areas appear to perceive speech as well as environmental sounds. However, little is known about the structure and function of these areas during early development, even though hearing is known to begin at approximately 5 months in utero. Studies in my lab focus on delineating the subdivisions of the auditory cortex at different stages of development based on their cytoarchitecture using histological and immunohistochemical techniques on post mortem brain tissue. Different parameters such as volumes of the auditory areas and neuron number will then be used to compare the auditory cortex during development and in adulthood. Future studies will focus on studying patterns of connections within the auditory cortex throughout development in normal individuals and compare them with those suffering from speech and hearing disorders.

Project 2: The upregulation of endogenously occurring neurogenesis for repairing the damage caused by lesions or neurodegeneration in adult brains continues to remain an intriguing possibility. One of the best model systems to study various factors underlying adult neurogenesis is a species of songbirds, namely zebra finches. Earlier studies have shown that new neurons are added to neural circuits in the brains of these birds throughout their adulthood. Interestingly, new neurons also become

incorporated within specialized circuits which are important for the production of songs in male zebra finches, which are used to court females. We are interested in studying the factors underlying the regulation of adult neurogenesis. Currently, we have localized opioid receptors in different brain regions including the ventricular and subventricular zone (VZ and SVZ) of adult male zebra finches. Since blocking opioid receptors increases neurogenesis, we are interested in studying whether the opioid system can be used as a tool to change levels of endogenous neurogenesis in zebra finches. Further, we are interested in studying whether increasing the levels of neurogenesis in adult male zebra finches would change their songs, which are normally highly stereotyped. In addition, we are also interested in studying the effects of manipulating levels of endogenous opioids on zebra finch behaviour, including singing.

Project 3: A number of behavioural studies have demonstrated that amongst birds, corvids (including crows, rooks, jays and starlings) can perform at par with non-human primates on cognitive tasks which require causal reasoning, imagination, flexibility and foresight. We are interested in studying whether indigenous species of corvids (house and jungle crows) can perform complex behavioural tasks such as tool use and what parts of the pallium (avian cortex) and basal ganglia are involved in these tasks. This project involves training crows on tasks involving visual discrimination and tool use (such as retrieving food items from a narrow tube with a stick) and then testing for the presence of immediate early genes such as zenk and c-fos which act as markers of neural activity in the brain. Since earlier studies on songbirds have shown that there is an increase in the incorporation of new neurons in some parts of the avian pallium when there is an increase in the need to process more complex kinds of information, we decided to study whether learning cognitively challenging tasks would lead to an increase in neurogenesis in adult crows. We are also interested in studying the basic organization and the major neurotransmitter systems of the crow brain.

2001-2003 Research Associate in Dr. Jon H. Kaas's lab, Vanderbilt University, Dept. of Psychology, Nashville, Tennessee, USA

Education:

1993- 2000 Ph.D, University of Southern California, Los Angeles, California USA

1989-1991 Master of Science (Anatomy). All India Institute of Medical Sciences, New Delhi, India

1986-1989 Bachelor of Science Hons. (Human Biology) All India Institute of Medical Sciences, New Delhi

Research Experience:

1992- 1993 Senior Research Fellow, Institute of Pathology (Indian Council of

Medical Research), New Delhi

Grants:

Emergence of primary and non-primary auditory cortical areas during late fetal and early postnatal ages in humans. Dept of Biotechnology, India (March 2005 – September 2008)

Effects of altering the levels of neuronal proliferation on the learning and production of song behavior in male zebra finches. Dept of Biotechnology, India (December 2007 – December 2010).

Opioid modulation of song in male zebra finches. Dept. of Science and Technology, India (June 2010 – December 2013)

Neurobiology and understanding Circadian system linkage of cognitive performance in an avian model system. Dept. of Science and Technology, India (January 2011 – January 2014)

Effects of the δ-Opioid Receptor System on Singing and Song Learning in Zebra Finches. Dept. of Science and Technology, India (Sept 2016 – Sept 2019)

The Sensitive Period of the Human Auditory Cortex – a Neuroanatomical Study. Indian Council of Medical Research, India. ICMR #2019-0155 [No. 51/4/2019-Ana/BMS] (Sept 2019 – Sept 2022); Rs 42.096 Lakhs

Exploring Auditory Perception in House Crows using functional Magnetic Resonance Imaging and Neuroanatomical Techniques. Dept. of Science and Technology, India. Collaboration with Prof S Senthil Kumaran, AIIMS, New Delhi. CRG/2019/002672 (May 2020 – May 2023); Rs 28.04 Lakhs (NBRC), Rs 37.22 Lakhs (AIIMS)

Autism Spectrum Disorders, Genes and the Gut Microbiome: Utilizing Song Birds (Zebra Finches) as a Model System. Dept. of Science and Technology, India. Collaboration with Prof Manoj Raje and Prof Saumya Raychaudhuri, CSIR-IMTECH, Chandigarh; DST/CSRI/2017/69 (March 2021 – March 2024); Rs 41.45 Lakhs

Book Chapters:

1. Kumar S and **Iyengar S** (2018): Avian Striatal Complex, Encyclopedia of Animal Cognition and Behavior. Edited by Jennifer Vonk and Todd K. Shackelford; Springer Nature Switzerland AG; https://doi.org/10.1007/978-3-319-47829-6_1441-1
2. **Iyengar S,** Parishar P and Mohapatra AN (2017): Avian Cognition and Consciousness - from the Perspective of Neuroscience and Behaviour, Self, Culture and Consciousness: Interdisciplinary Convergences on Knowing and Being. Springer Nature Singapore Pte Ltd.; DOI 10.1007/978-981-10-5777-9. Eds: S. Menon, N. Nagaraj and VV Binoy, Chapter 2, Pg 23-50;
3. **Iyengar S** (2012): Development of the Human Auditory System. J. Indian Inst. Sci. 92:4; 427-440 (Invited review), in the issue on "Development and Disorder of the Nervous System", edited by Prof. TN Guru Row, guest-edited by Dr. S. Mani.
4. **Iyengar S** (2010) Comparative and Evolutionary Aspects of Cognition. Chapter in "'Expanding Horizons of the Mind Science(s)" Edited by Prof. PN Tandon and Prof RC Tripathi.

Publications:

1. Parishar P, Sehgal N and **Iyengar S** (2021): The Expression of delta opioid receptor mRNA in adult male zebra finches (*Taenopygia guttata*). PLoS ONE 16(8): e0256599. https://doi.org/10.1371/journal.pone.0256599.
2. Parishar P, Mohapatra AN and **Iyengar S** (2021): Investigating Behavioral Responses to Mirrors and the Mark test in adult male Zebra Finches and House crows. (2021) Frontiers in Psychology, Accepted. Article 637850; doi: 10.3389/fpsyg.2021.637850.
3. Kumar S, Mohapatra AN, Pundir AS, Kumari M, Din U, Sharma S, Dutta A, Arora V, **Iyengar S** (2020): Blocking Opioid Receptors in a Songbird Cortical Region modulates the Acoustic Features and Levels of Female-Directed Singing. (2020) Frontiers in Neuroscience, September 2020; Volume 14; Article 554094; doi: 10.3389/fnins.2020.554094
4. Singh UA and **Iyengar S**. (2019): The Expression of DARPP-32 in Adult Male Zebra Finches (*Taenopygia guttata*). Brain Structure and Function. DOI: 10.1007/s00429-019-01947-0.
5. Kumar S, Mohapatra AN, Sharma H, Singh UA, Kambi N, Velpandian T, Rajan R, **Iyengar S** (2019): Altering opioid neuromodulation in the songbird basal ganglia

modulates vocalizations. Frontiers in Neuroscience, (Neuropharmacology) July 3 2019, DOI: 10.3389/fnins.2019.00671.

6. Sen S*, Parishar P*, Pundir AS, Reiner AJ and **Iyengar S** (2019): The Expression of Tyrosine Hydroxylase and DARPP-32 in the House Crow (*Corvus splendens*) brain. (2019). J. Comp. Neurol. 527(11):1801-1836. doi: 10.1002/cne.24649. * Equal contribution.
7. Singh UA*, Kumari M* and **Iyengar S** (2018): Method for improving the quality of genomic DNA obtained from minute quantities of tissue and blood samples using Chelex 100 resin. Biol Proced Online. 2018 Jun 1;20:12. doi: 10.1186/s12575-018-0077-6. eCollection 2018. * Equal contribution.
8. Pundir AS*, Singh UA*, Ahuja N, Makhija S, Dikshit PC, Radotra B, Kumar P, Shankar SK, Mahadevan A, Roy TS, **Iyengar S** (2015) Growth and Refinement of Excitatory Synapses in the Human Auditory Cortex. Brain Structure and Function; 221(7), 3641-3674. * Equal contribution.
9. Sharma J, Mukherjee D, Rao S, **Iyengar S**, Shankar SK, Satishchandra P and Jana NR (2013) Neuronatin mediated aberrant calcium signaling and endoplasmic reticulum stress underlie neuropathology in Lafora disease. Journal of Biological Chemistry, 288(13); 9482-9490.
10. Pundir AS, Hameed LS, Dikshit PC, Kumar P, Mohan S, Radotra B, Shankar SK, Mahadevan A, **Iyengar S** (2012) Expression of Medium and Heavy Chain Neurofilaments in the Developing Human Auditory Cortex. Brain Structure and Function; Volume 217, Issue 2: 303-321.
11. Haldipur P, Bharti U, Alberti C, Sarkar C, Gulati G, Iyengar S, Gressens P, Mani S (2011) Preterm Delivery Disrupts the Developmental Program of the Cerebellum. PloS ONE; 6(8).
12. Haldipur P, Bharti U, Govindan S, Sarkar S, **Iyengar S**, Gressens P, Mani S (2011) Expression of sonic hedgehog during cell proliferation in the human cerebellum. Stem Cells and Development.; 21(7): 1059-1068
13. Khurshid N, Hameed, LS, Mohanasundaram, S and **Iyengar S** (2010) Opioid modulation of cell proliferation in the ventricular zone of adult zebra finches (*Taenopygia guttata*). FASEB J. 24; 3681-3695.
14. Khurshid N, Jayaprakash, N, Hameed, LS, Mohanasundaram, S and **Iyengar S** (2010) Opioid modulation of singing in male zebra finches (*Taenopygia guttata*). Behav. Brain Res. 208 (2); 359–370.

15. Khurshid N, Aggarwal V and **Iyengar S** (2009): Localization of μ- and δ- opioid receptors in song control regions of adult male zebra finches (*Taenopygia guttata*). J. Chem. Neuroanat. 37(3); 158–169.
16. Tripathi A, Khurshid N, Kumar P, **Iyengar S** (2008) Expression of μ- and δ- opioid receptor in the proliferative neuroepithelium of the developing human neocortex. Neurosci. Res. 61: 257–270.
17. Karunakaran S, Diwakar L, Saeed U, Agarwal V, Ramakrishnan S, **Iyengar S**, and Ravindranath V (2007) Activation of apoptosis signal regulating kinase 1 (ASK1) and translocation of death-associated protein, Daxx, in substantia nigra pars compacta in a mouse model of Parkinson's disease: protection by alpha-lipoic acid. FASEB J.; 21(9):2226-2236.
18. **Iyengar, S**, Jain, N, Qi, HX and Kaas, JH (2007) Cortical and Thalamocortical Connections of the Oral Cavity Representations in Area 3B of New World Monkeys. J. Comp. Neurol. 501(1): 95 – 120.
19. Kaas JH, Qi HX, **Iyengar S**. (2006) Cortical network for representing the teeth and tongue in primates. Anat Rec A Discov Mol Cell Evol Biol.; 288(2):182-190.
20. **Iyengar, S**, and Bottjer SW (2002) Developmental Changes within Individual Axon Arbors of a Thalamocortical Circuit Necessary for Song Learning in Zebra Finches **J. Neurosci 22(3): 901-911**.
21. **Iyengar, S**, and Bottjer SW (2002) The Role of Sensory Experience in the formation of Neural Circuits Underlying Vocal learning in Zebra Finches **J. Neurosci 22(3): 946-958**.
22. **Iyengar, S**, Viswanathan SS, and Bottjer SW (1999) Development of Topography within Song Control Circuitry of Zebra Finches during the Sensitive Period for song learning. **J. Neurosci. 15 :19(14): 6037-6057**.
23. Iyengar, B, Subalakshmi, R, **Iyengar, S**, Murthy, J (1996) Melanotrophin Dependence of Proliferating Melanocytes In: **Growth Disorders of the Pigment Cell (eds. Iyengar, B and Singh, A) BI Churchill Livingstone: New Delhi**.

Abstracts:

1. UA Singh and **S Iyengar** (2019): Fine-tuning birdsong: The role of delta opioid receptors in the development of song structure. # 3655, Annual Meeting of the Society for Neuroscience, 2019, Chicago, USA. **This abstract was selected as a Neuroscience 2019 Hot Topic (Only ~100 out of the over 14,000 abstracts submitted to Neuroscience

2019 are awarded this recognition. It was shared with the media as part of Neuroscience 2019's Hot Topics book and in the Neuroscience 2019 online press room).

2. AN Mohapatra, AS Pundir, B Radotra, R Kumar, B Hans, S Dhaka, SK Gupta and **S Iyengar** (2018): A Morphometric Study of Parvalbumin-positive Neurons in the Developing Human Auditory Cortex. The Necessity of Cell Types for Brain Function, Fall Brain Conference 2018, 7-10 October 2018: Moltkes Palæ, Copenhagen, Denmark. *Awarded IBRO-PERC, The Brain Prize and FENS stipend (1000 Euros) to attend the conference.
3. Pundir AS, Singh UA, Ahuja N, Makhija S, Dikshit PC, Radotra B,Kumar P, Shankar SK, Mahadevan A, Roy TS, **Iyengar S** (2017): Establishment of Cortico-Cortical and Thalamocortical Circuits in the Human Auditory Cortex. 104th Indian Science Congress, Hyderabad, 3rd - 7th Jan.
4. S Sen, P Raghunathan, SS Kumaran and **S Iyengar** (2016): A Three-Dimensional Digital Atlas of the Indian House Crow (*Corvus splendens*) Brain. Poster, XXXIV Annual Conference of Indian Academy of Neurosciences, NBRC, Manesar, Oct 19th - 21st.
5. S Sen, S Paul, P Raghunathan, SS Kumaran and S Iyengar (2016): A Three-Dimensional Stereotaxic MRI Brain Atlas of House Crows (*Corvus splendens*). Poster, Nov 12th - 16th. Annual Meeting of Society for Neuroscience,San Diego, CA, USA.
6. Kumar S, Narayanan R, Mohapatra AN, Singh UA, Sharma S, **Iyengar S** (2015): Role of μ-ORs in the Motivation to Sing and on Song Structure in Male Zebra Finches. Poster, An International Symposium On Neuropeptides and Neurotransmitters: Role in Physiology and Pathophysiology, Second Meeting of Indian Sub-Continental Branch of the International Neuropeptide Society, NISER and ILS (Inst. of Life Sciences), Bhubaneswar, Dec 13-14.
7. Singh UA, Ramanathan N, Kumar S, Parishar P, **Iyengar S** (2015): Learning to strike the right chord: Delta opioid receptors and their role in the development of song structure in zebra finches. Poster, An International Symposium on Neuropeptides and Neurotransmitters: Role in Physiology and Pathophysiology, Second Meeting of Indian Sub-Continental Branch of the International Neuropeptide Society, NISER and ILS (Inst. of Life Sciences), Bhubaneswar, Dec 13-14.
8. Pundir AS, Singh UA, Ahuja N, Makhija S, Dikshit PC, Radotra B,Kumar P, Shankar SK, Mahadevan A, Roy TS, **Iyengar S** (2015): Establishment of Cortico-Cortical and Thalamocortical Circuits in the Human Auditory Cortex. Poster, Bangalore Microscopy Course, Sept 20-27.

9. Sen S, **Iyengar S** (2014): The Dopaminergic System in Corvids. Poster, IAN, Nov 2014, Bangalore.
10. Pundir AS, Singh UA, Ahuja N, Radotra B, Kumar P, Dikshit PC, Shankar SK, Mahadevan A, **Iyengar S** (2014): Establishment of Cortico-Cortical and Thalamocortical Circuits in the Human Auditory Cortex. Poster, IAN, Nov 2014, Bangalore.
11. **Iyengar S**, Pundir AS, Singh UA, Ahuja N, Radotra B, Kumar P, Dikshit PC, Shankar SK, Mahadevan A (2014): Development of cortico-cortical and thalamocortical excitatory neural circuits in the human auditory cortex. International Conference on Auditory Cortex. Madgeburg, Germany, Sept 13th - 17th. Abstracted in "Proceedings of the 5th International Conference on Auditory Cortex - Towards a synthesis of Human and Auditory Research" Edited by Eike Budinger, pp. 74.
12. **Iyengar S**, Pundir AS, Radotra BD, Kumar P, Dikshit PC, Shankar SK, Mahadevan A (2012) Development of excitatory neural circuits in the human auditory cortex. The 8th FENS Forum of Neuroscience, 14 - 18 July, Barcelona, Spain.
13. Sen S, Hameed LS, Ramanathan N and **Iyengar S** (2012) Role of the Endogenous Opioid System in modulating Adult Neurogenesis in Zebra Finches (*Taenopygia guttata*). 19th Biennial Meeting of the International Society for Developmental Neuroscience, 11-14 January, Mumbai, India. Theme: Neurodevelopment and Neurological diseases.
14. Ramanathan N and **Iyengar S** (2011) Role of δ-opioid receptors on female directed song and other behaviours in male zebra finches. 8th Horizons in Molecular Biology, International PhD Student Symposium, 14-17 September, 2011, Göttingen, Germany
15. Hameed LS, Pundir AS, Radotra BS, Kumar P, Mohan S, Dikshit PC, Shankar SK, Mahadevan A, **Iyengar S** (2010) Development of Connectivity in the human auditory cortex. Indian Association of Neurology, Annual Meeting, Lucknow.
16. Pundir AS, Radotra BS, Kumar P, Dikshit PC, **Iyengar S** (2009) Development of the perinatal and postnatal human auditory cortex. Indian Association of Neurology, Annual Meeting, Jaipur.
17. Pundir AS, Krishnasamy S, Kar S, Radotra BS, Kumar, P, Dikshit PC, **Iyengar, S** (2009) The human auditory cortex during the third trimester and at term. Annual Meeting of Society for Neuroscience, Chicago, IL, USA
18. Tripathi A, **Iyengar S** (2007) Expression of opioid receptors in the human ventricular and subventricular zones during the first and second trimester of gestation. Indian Association of Neurology, Annual Meeting, Lucknow.

19. Haldipur PV, Sarkar C, **Iyengar S**, Mani S (2007) Role of Sonic Hedgehog signalling in human cerebellum development. Indian Association of Neurology, Annual Meeting.
20. Khurshid N, **Iyengar S** (2007) Effects of blocking opioid receptors on the proliferative neuroepithelium of adult male zebra finches. Annual Meeting, Society for Neuroscience, San Diego, CA, USA
21. Sudarshan, S., Pundir, AS and **Iyengar, S**. (2006) Development of the human auditory cortex during the third trimester and at term. Presented at the Third NBRC International Conference, New Delhi.
22. Khurshid, N. and **Iyengar, S** (2006) Expression of opioid receptors in the adult zebra finch brain. Presented at the Third NBRC International Conference, New Delhi.
23. Tripathi, A. and **Iyengar, S** (2006) Expression patterns of opioid receptors in the ventricular and subventricular zone in the human fetal brain. Presented at the Third NBRC International Conference, New Delhi
24. Karunakaran S, Diwakar L, Saeed U, Ramakrishnan S, **Iyengar S** and Ravindranath V (2006) Activation of apoptosis signal regulating kinase 1 (ASK1) and translocation of death-associated protein, Daxx, in substantia nigra pars compacta in a mouse model of Parkinson's disease: protection by alpha-lipoic acid. Presented at the Third NBRC International Conference, New Delhi.
25. Khurshid N, **Iyengar S** (2006) Localization of Opioid Receptors in Male Zebra Finches. Indian Association of Neurology, Annual Meeting.
26. **Iyengar, S**, Jain, N, Qi, HX and Kaas, JH (2002) Cortical and Thalamocortical Connections of the Oral Cavity Representations in Area 3B of New World Monkeys. Soc. Neurosci Abstr.
27. **Iyengar, S**, and Bottjer, SW (1998) Growth and regression in a thalamocortical projection during the sensitive period for vocal learning in zebra finches. Soc. Neurosci Abstr 467.13, Vol 24, part 1, p.1189
28. **Iyengar, S**, Viswanathan SS, and Bottjer SW (1997) Development of topographic organization in neural circuits for vocal learning in zebra finches Soc. Neurosci Abstr 523.13, Vol 23, part 2, p.1330

Talks/Lectures

2006

"Studies on developmental and adult neural plasticity using songbirds as a model system." National Symposium on Neural Plasticity and Repair, New Delhi, Organized by AIIMS, New Delhi and Indian Society of Pain Research and Therapy, Oct 18-19, 2006.

Guest lectured for the 5th NMR School entitled "A New Dimension to NMR: From molecules to Human Behaviour" held at MAHE, Manipal, May 22 - June 2, 2006.

2007

"A comparison of the human auditory cortex at different stages of development." Indo-US Symposium on Developmental Neuroscience and Imaging, New Delhi, Organized by NBRC, funded by the Indo-US Science and Technology Forum, Feb 19-21, 2007.

"The development of the human auditory cortex." 9th Karnataka Chapter of Anatomists, Conference and Workshop (Special theme: Recent Advances in Neuroanatomy) organized by JSS Medical College, Mysore, May 25-27, 2007.

"The expression of different markers and changes in cytoarchitecture in the developing human auditory cortex." Current Trends in Auditory Research, MAMC, Sept 21-22, 2007.

2008

"Development of the Human Auditory Cortex – Neuroanatomical Studies." Symposium on Brain, Cognition and Behaviour, Sch. Of Language, Lit. and culture studies, JNU, March 14-15, 2008.

"Methods in Neuronal and Axonal tracing." Workshop on Imaging Neurodegeneration: Molecules to mind, IIT-Delhi, Sept 5-6, 2008.

2009

"The Auditory System" Presented for "The Making of Mind", Cognitive Neuroscience Workshop organized by IBRO and NBRC, Jan 5-16, 2009.

"The role of the opioid system in singing and other behaviours in adult male zebra finches" Functional Biology: Comparative Aspects, 2nd Mtg of the Indian Subcontinent Branch, of the International Peptide Society, Dept. of Zoology, University of Lucknow, March 19-21, 2009

"Development of the Human Auditory Cortex – Neuroanatomical Studies" Presented at the Psychology Dept., Vanderbilt University, Nashville, TN, USA, October 22-23, 2009.

"The Auditory Cortex – a Neuroanatomical Investigation" Presented at the National Programme on Perception Engineering (Technical Workshop) held at NBRC, Manesar, Dec 4-5, 2009.

2010

"Introduction to the Human Brain" Presented at the IBRO-APRC (Asia Pacific Regional Committee) School of NeuroImaging (Theme: Study of Human Brain Structure and Function using Magnetic Resonance Imaging and Spectroscopy.) held at NBRC, Manesar, Nov 29 - Dec 10, 2010

2011

"Basics of the Auditory System"
"'Bird Brains' and Mammalian brains – Comparative Aspects" "The Opioid System in Zebra Finches"
Presented at the Fourth DST-SERC School in Neuroscience (Systems and Cognition), NBRC, Manesar, Feb 21 – March 6, 2011.

"Song Learning in Birds"
Presented at the Brain and Cognition Workshop (sponsored by DST and IUSSTF), IISc, Bengaluru, July 7, 2011.

2012

"Birdsong and Learning"
Presented at the Fifth DST-SERC School in Neuroscience (Learning and Memory), NIMHANS, Bangalore, Feb 16 – Feb 29, 2012.

"Organization of the Vertebrate Nervous System"
"Comparative Aspects of Brain Evolution - Mammals versus Birds"
Fourth DST-SERB school in Chronobiology, NEHU, Shillong, June 20-21, 2012

"Auditory System – I" "Auditory System – II"
Sixth DST-SERB School in Neuroscience, National Institute of Science Education and Research (NISER), Bhubaneswar, Orissa, Dec 18-19, 2012

2013

"Auditory System – I"
"Neuromodulators and learning in songbirds" Lab: Anatomy of Bird Brain
Seventh DST-SERB School in Neuroscience, Centre for Neural and Cognitive Sciences, University of Hyderabad, Dec 11-12, 2013

2014

"Cognition in Corvids"
Invited lecture, Sophia College, Mumbai, Feb 6, 2014

"Development of Neural Circuits in the Human Auditory Cortex"
Invited lecture, International Symposium on Translational Neuroscience and XXII Annual Conference of Indian Academy of Neuroscience, NIMHANS, Bangalore, Nov 2, 2014

“Auditory System”
Eighth DST-SERB School in Neuroscience, Centre for Neural and Cognitive Sciences, IISER Pune, Dec 13, 2014

2015
“Principles of Immunohistochemistry” Invited lecture, Dept of Anat, MAMC, March 13th, 2015.
“Vocal Learning and the Songbird Brain”

“Opioid Modulation of Singing and Song Learning in Zebra Finches”
Third DST-SERB School in Avian Biology, Department of Zoology, North Eastern Hill University, Shillong, October 2nd – 3rd, 2015.

“Establishment of Neural Circuits in the Human Auditory Cortex” Invited lecture, School of Life Sciences, Jawaharlal Nehru University, New Delhi, November 17, 2015.

“Avian Cognition - from the Perspective of Neuroscience and Behaviour” Invited lecture, International Conference presented by NIAS Consciousness Studies Programme on Consciousness, Cognition and Culture: Implications for the 21st Century JRD Tata Auditorium, NIAS (National Institute of Advanced Studies), Bangalore, December 9th-11th, 2015.

“The Opioid System in Songbirds - its Role in Singing” Invited lecture,
An International Symposium On Neuropeptides and Neurotransmitters: Role in Physiology and Pathophysiology, Second Meeting of Indian Sub-Continental Branch of the International Neuropeptide Society. NISER and ILS (Inst. of Life Sciences), Bhubaneswar, December 13th-14th, 2015.

2016
“Cognition in Corvids – an Avian Model System” – Lecture, Cognitive Science workshop and NBRC-IITD workshop, January 16, 2016

"The Effects of Opioids on Vocalization and Vocal learning using Songbirds as a Model System" IBRO-APRC (Asia Pacific Regional Committee) School, NBRC "Theme: Development and Functions of Brain Circuits : From Molecules to Behaviour"; March 18th ; 2016

“Mirror, Mirror on the Wall …….and some other aspects of Corvid Brain Structure and Cognition”
Invited Talk (Host: Dr. Raghav Rajan), IISER Pune; July 25; 2016

“The Role of Mu-Opioid receptors in modulating the songs of Adult Male Zebra Finches”
NeuroGroup Meeting, Khandala, Pune; Sept-25-26; 2016

Effects of Mu-opioid Receptor Modulation on Singing in Adult Male Zebra Finches
XXXIV Annual Conference of Indian Academy of Neurosciences, NBRC, Manesar; Oct 19- 21; 2016.

2017

"Opioid Neuromodulation and the Motivation to Sing in Adult Male Zebra Finches" International Symposium on Biological Timing and Health Issues in the 21st Century (in conjunction with the IUSSTF-sponsored Indo-US Workshop and Symposium)
Department of Zoology, University of Delhi. Indo-US Joint Center on Biological Timing, University of Delhi, The Indian Society for Chronobiology; Feb 21-24; 2017

"Development of the Human Auditory Cortex"
TEDx event organized by the Inst of Chemical Engg., Mumbai; 8th April, 2017 "Opioid Neuromodulation and Singing in Male Zebra Finches"

XXVI International BioAcoustics Congress, Haridwar, 8th - 13th Oct, 2017.

"Opioid Modulation of Song Learning in Male Zebra Finches"
35th IAN meeting, Ravenshaw College, Cuttack, Odisha; 29th - 31st Oct, 2017.

"Neural Circuits, Singing and Song Learning in Zebra finches"
The challenge to learn: New approaches to study the problem of stability vs. plasticity in the brain. Organized by Indo-German Seminar, Indian National Science Academy and the German Academy of Sciences Leopoldina. LV Prasad Eye Institute, Hyderabad. 28th - 29th Nov; 2017.

2018

"Neuroplasticity in the Developing Human Auditory Cortex"
IBRO-APRC School, Organized by the Dept of Physiology, AIIMS, New Delhi; 21st Oct - 4th Nov, 2018.

"Development of Axonal Connections in the Human Auditory Cortex"
3rd IBRO/APRC Chandigarh Neuroscience School, Panjab University, Chandigarh, 1st Dec; 2018.

"Three-dimensional reconstruction of Neurons"
3rd Asian and African Stereology Congress, Maulana Azad Medical College, New Delhi; 18th - 20th Dec; 2018.

2019

"Corvid Brain Structure, Cognition and Mirror Self-Recognition"
BIOSPARKS-2019, Organized by the School of Life Sciences, JNU, New Delhi, 15th - 16th March; 2019

"Brain Structure and Behaviour in Songbirds" Abstract submitted. International Workshop on Social Network of Animals in Extreme Environment of Antarctica with Special Reference to Penguins including Field Studies; Zoological Survey of India, MoES (Ministry of Earth Sciences), Port Blair; 22nd - 24th April; 2019

"The Role of the Opioid System in Singing and Song Learning in Zebra Finches" Invited lecture, Dept of Psychology, Vanderbilt University, Nashville, TN, USA; 24th October, 2019.

"Neural Plasticity and the Development of Axonal Connections in the Human Auditory Cortex" IAN 2019, All India Institute of Medical Sciences, New Delhi; 19th - 21st November, 2019

2020

"Neural Correlates of Learning and Decision-Making in House Crows"
The Neurogroup meeting, Dadhikar Fort, Alwar, Rajasthan, March 8th - 9th; 2020; organized with Dr Rema Velayudhan and Prof N Jain, NBRC, Manesar

2021

"Brain-behaviour interactions in the 'Shining Raven'"
Synapse: Symposium, IISER, Tirupati, December, 4th.

Conferences/Workshops Organized:

The Neurogroup Meeting, Alwar, Rajasthan, March 8th and 9th, 2020.

Indo-US Symposium on Developmental Neuroscience and Imaging, New Delhi, Feb 19th - 21st, 2007, funded by the Indo-US Science and Technology Forum, organized with Dr. NC Singh

Fourth DST-SERC school in Neuroscience (Systems and Cognition), NBRC, Manesar, Feb 21st - March 6th, 2011, organized with Prof. N. Jain

Conferences/Workshops Attended:

Workshop on High Speed Multiphoton confocal microscopy and imaging, NBRC, Manesar, Sept 21st - 23rd, 2010.

Workshop on Tissue Banking, ILBS, Delhi in collaboration with NIH, USA, Sept 17th, 2011.

International Workshop on the Evolution of Human Cognition, IISER, Pune, Nov 17th - 19th, 2013

Meeting "Adult Neurogenesis: From Stem Cells to Therapies", TIFR, Mumbai, Feb 6th - 8th, 2014.

Conference "Brain Modes"; NBRC, Manesar, Dec 13th – 14th; 2017

Membership of professional bodies / societies:

Indian Association of Neuroscience

International Brain Research Organization

Society for Neuroscience, USA

Editorial Responsibilities:

Editorial Board Member, Developmental Neuroscience (Karger), Editor-in-Chief Steven W. Levison

Review Editor, Frontiers in Molecular Neuroscience

Research supervision and Manpower Training:

Teaching:
I have been the Course Coordinator of the Neuroanatomy Course which is a part of the first year course-work for NBRC PhD and Integrated MSc-PhD students from 2004 until now (20121). Neuroanatomy is a 6-week course and in addition to didactic lectures, students are given demonstrations of preserved post-mortem human brains to help them visualize the location of various brain regions. I have also given lectures on the Auditory System for the Systems Neuroscience course at NBRC. Furthermore, I have been the Course Coordinator for Developmental Neuroscience for two years (2010 – 2011) and the Course Coordinator for Systems Neuroscience for one year (2019 – 2020) and have taught as part of the course.

Ph.D., Integrated MSc-Ph.D. and MSc Research Supervision:
PhD students

Nazia Khurshid (PhD student) 2004 – 2010 (completed)
Role of Opioid System in Behavior and Cell Proliferation in Adult Male Zebra finches (*Taenopygia guttata*), PhD Thesis. Submitted Feb 18th, 2010, Awarded July 15th, 2010.

Sandeep Kumar (PhD student) 2011- 2021 (completed)
Opioid Modulation of Singing in Adult Male Zebra Finches, PhD thesis. Submitted Sept 2020, Awarded 3/2/2021

Mukta Kumari (PhD Student) 2015- (ongoing)
Anjali Bind (PhD Student) 2020- (ongoing)

Integrated MSc-PhD students

Shankhamala Sen (Integrated MSc-PhD student) 2010 - 2021 (completed)
Neuroanatomical Studies of the House Crow (*Corvus splendens*) Brain. Submitted Feb 22nd, 2021, Awarded in August, 2021.

Uzma Din (Integrated MSc-PhD student) 2011- (ongoing)

Pooja Parishar (Integrated MSc-PhD student) 2012- (ongoing)

Utkarsha A. Singh (Integrated MSc-PhD student) 2012- 2021 (completed)
Role of Delta Opioid Receptors in Singing and Song Learning in Zebra Finches. Submitted March 11th, 2021.

MSc students

Geetika Phukan (MSc student)	2005 – 2006 (completed)
Anushree Tripathi (MSc student)	2006 – 2007 (completed)
Varsha Ramakrishna (MSc student)	2017-2018 (completed)
Rishika Tiwari (MSc student)	2019- 2020 (completed)
Bhanumita Agrawal (MSc student)	2020 – 2021 (completed)
R. Madhumita (MSc student)	2021 - (ongoing)

Project Assistants:

Nazia Khurshid	2003 - 2004
Taruna Ladha	2003 - 2004
Radhika Rajan	2004 - 2005
Subashini Sudarsan	2005 - 2006
Souvik Kar	2007 - 2008
Naveen Jayaprakash	2007 - 2008
Anushree Tripathi	2007 - 2008
Senthil Krishnasamy	2008 – 2009
L. Shahul Hameed	2008 – 2011
Sivaraj Mohanasundaram	2008 – 2010
M. Sakthivel	2009 - 2010
N. Ramanathan	2010 – 2011
Neethu Michael	2010 – 2011
Nikhil Ahuja	2010 – 2012
Tanveer Verma	2011 – 2012
Sudha Sharma	2012 – 2014
Sonal Makhija	2014 – 2015
Alok Nath Mohapatra	2014 – 2018
Shankhamala Sen	2017 - 2018
Sandeep Kumar	2017 - 2020
Uzma Din	2018 – 2021
Pooja Parishar	2019 – ongoing

Summer Students:

Mala Upadhyay	2004
Atulya Prasad	2008
N. Ramanathan	2009
Shilpa	2009
Awalpreet Singh Chadha	2010
Krishan Sharma (Observer)	2011
Sonal Makhija	2012
Suchet Nanda	2012
Alok Nath	2013
Aditya Nayak	2013
Ananta Nair (Observer)	2013
Niveditha Sekharan	2014

PS Laxmi (Observer) 2014
Shubham Chajjed 2015
Vishakha Bambroo (Observer) 2015
Rahul Mazumdar 2016
Anwesha Mukhopadhayay (Observer) 2016
Priyanka Pant 2016
Sumyuktha Vijay (Observer) 2017
Deepika, Anagha (Observer) 2018
R Archana 2019
Namia Ahmed 2019
Prakriti Maurya (Observer) 2019