

Dated: Aug 2019

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## Curriculum Vitae

### Education

- Ph.D. Physics. University of California, Davis, USA, 2002.  
(Theoretical Particle Physics, Advisor: James Wells.)  
(Intercampus exchange to University of California, Berkeley, USA, 1998-2002.)
- M.S. Applied Physics. University of California, Davis, USA, 1998.
- M.S. Electrical Engineering, University of Arkansas, Fayetteville, USA, 1996.  
(Neural Network Controls, Image/Digital Signal Processing)
- B.E. Electronics & Communication. BMSCE, Bangalore University, India, 1992.

### Fellowships

- Kavli Fellow, National Academy of Sciences (NAS), and, The Kavli Foundation, USA, 2015.

### Academic Appointments

- *Professor*, Theoretical physics faculty, Institute of Mathematical Sciences (IMSc), India, July 2016 – Present.
- *Reader*, Theoretical physics faculty, Institute of Mathematical Sciences (IMSc), India, July 2011 – June 2016.
- *Assistant Professor*, Homi Bhabha National Institute (HBNI), India, to which IMSc is affiliated, Feb 2010 – Present.
- *Fellow E*, Theoretical physics faculty, Institute of Mathematical Sciences (IMSc), India, Sept 2009 – June 2011.

### Research Appointments

- Research Associate, Theoretical Particle Physics, University of Melbourne, Australia, May 2010 – Dec 2010.
- Research Associate, High Energy Theory Group, Brookhaven National Laboratory, USA, Oct 2006 – Aug 2009.
- Post-doctoral Associate, Theoretical High Energy Physics, Northwestern University, USA, Sept 2004 – Sept 2006.

- Research Associate, Theoretical High Energy Physics, Michigan State University, USA, Sept 2002 – Aug 2004.
- Participating Guest, Theoretical Physics Group, Lawrence Berkeley Laboratory, USA, July 1999 – 2002.
- Student Employee Graduate Research Fellowship, Lawrence Livermore National Laboratory, Livermore, USA, 1997 – 2002.
- Postgraduate Researcher, Lawrence Livermore National Laboratory, USA, May 1996 – July 1997.
- Graduate Research Assistant, University of Arkansas, USA, Jan 1994 – Apr 1996

## Research Interests

- *Phenomenology of physics beyond the standard model of particle-physics*: extensions of the standard model of particle physics particularly relating to electroweak symmetry breaking and stability of the Higgs sector, for instance warped extra-dimensions, composite-Higgs, little-Higgs, supersymmetry, etc.; precision, flavor and high energy (collider) probes of new physics; Large Hadron Collider (LHC) phenomenology; dark matter candidates and detection prospects; cosmology particle physics connection.

## Research Visits

- CERN Theory Group, BSM Institute, June - July 2012; May - June 2014.

## Students Supervised at IMSc

- *Ph.D. Thesis Advisor* of:
  - Tuhin Subhra Mukherjee, thesis title: “Effective Models of Beyond the Standard Model Scalars Coupled to Vector-like Fermions and their Phenomenology”; completed Sept. 2017.
  - Soumya Sadhukhan; thesis title: “The Phenomenology of Beyond the Standard Model Scalars due to Extended Symmetries with New Fermions”, completed April 2017.
  - Tanumoy Mandal; thesis title: “Phenomenology and LHC signatures of exotic fermions”; completed Oct 2013.
- *M.Sc. Thesis Advisor* of:
  - Anish Ghoshal (IIT-Madras), “Vector-like Lepton Dark Matter”. May 2015 – May 2016. (Joint advisor with Prof. James Libby of IIT-Madras).
  - Shibasis Roy, “Introduction to Little-Higgs Models”. Jan 2015 – July 2015.
  - Soumya Sadhukhan, “Radion phenomenology”. Jan 2012 – Dec 2012.
  - Tuhin Subhra Mukherjee, “Triviality and Vacuum Stability Bounds in the Higgs Sector”. Jan – June 2011.
  - Oindrila Ghosh, “Computation of Relic Density and Direct Detection of Dark Matter in a Toy Model.” Jan – July 2011.

- Post-M.Sc. project advisor of Vidhiya Saravanan, “Top Forward-Backward Asymmetry at the Tevatron.” Feb – July 2011.
- On the doctoral and monitoring committees of many IMSc students.

### Graduate-level courses taught at IMSc

- Quantum Field Theory II, Jan – Apr 2019.
- Particle Physics II (taught with others), 8 lectures on electroweak symmetry breaking, Higgs and dark matter, Mar-Apr 2018.
- Gravitation and Cosmology, Jan – Apr 2017.
- Particle Physics II (taught it with 3 others), Jan – Apr 2015.
- Particle Physics I, Aug – Dec 2014.
- Supersymmetry Phenomenology (5 lectures), March 2014.
- Quantum Field Theory II, Jan – Apr 2013.
- Quantum Field Theory I, Aug – Dec 2011.
- Reading Course in Cosmology, Oindrila Ghosh, Jan - June 2011.

### Pedagogical Lectures

- Twelve lectures on “Standard Model of Particle Physics,” in the SERB Preparatory school on Theoretical High Energy Physics, to graduate students from across India, Tezpur University, Assam, Oct 28 - Nov 9, 2019.
- Twelve lectures on “Particle Physics and the standard model,” in the SERC Preparatory school in THEP, to graduate students from across India, IIT-Gandhinagar, Sep 19 - 30, 2016.
- “Physics beyond the SM.” Three lectures to experimental High Energy Physics graduate students, 9th SERC School on EHEP, IIT-Madras, Dec 2013.
- Tutor for the course on Supersymmetry taught by Prof. Romesh Kaul at the Theoretical SERC main school, IIT-Kanpur, Nov 2013.
- “Introduction to MSSM.” Status of Supersymmetry and Dark Matter (SUSY-DM), CHEP IISc, Bangalore, Oct 2013.
- ”New Physics Expectations at the LHC.” Introductory talk for graduate students, IMSc (Oct 2009); SERC Preparatory School, IIT-Madras (Oct 2009).
- “Physics Beyond the Standard Model at the LHC,” and, “Dark Matter in Particle Physics,” three lectures in Workshop on Recent Trends in Nuclear and Particle Physics, Banaras Hindu University (BHU), Mar 2011.
- “Dark Matter in Particle Physics.” Two lectures in Kodaikanal Winter School, Dec 2009.
- “Dark Matter in Particle Physics.” For summer students, Dearborn Observatory, Northwestern University, July 2006.

- “Tiny Neutrino Masses - a theoretical perspective.” New Perspectives 2005, for graduate students, Fermilab, June 2005.
- “Introduction to the Physics of Extra dimensions.” Three-lecture series presented to the HEP group, Michigan State Univ. (Oct 2002).

## Public Lectures

- “Cosmology, Particle Physics, and Dark Matter”, inaugural address given to under-graduate and post-graduate students in “Ripples-2019” event at the Ethiraj College for Women, Aug 2019.
- “Origin of Mass”, IMSc Open Day, Lecture to high-school students, Sep 2018.
- “Theoretical Aspects of Dark Matter and Dark Energy”, Tamilnadu Science and Technology Centre, Chennai, Oct 2015.
- “Standard Model And Beyond”, Symposium on High Energy Physics, 102nd Indian Science Congress, University of Mumbai, 6 Jan 2015.
- “The Nobel Prize in Physics 2013: to Francois Englert and Peter Higgs”, 150<sup>th</sup> Science Club Meet, CLRI, March 2014.
- “The Large Hadron Collider”, given to undergraduate physics students in the series “Popular Lectures in Physics”, Stella Maris College, March 2010.

## Other Professional Activities

- Coordinator (one of two) of standard model and beyond working group, 15th Workshop on High Energy Physics and Phenomenology (WHEPP-XIV), IISER-Bhopal Dec 14-23, 2017.
- Coordinator (one of three) of standard model and beyond working group, XXII DAE-BRNS High Energy Physics Symposium 2016, University of Delhi, New Delhi, India, Dec. 12 - 16, 2016.
- IMSc Committees: Computer Committee, Aug 2010 - Aug 2011; Guest-house Advisory Committee, Aug 2011 - July 2015; HEP-group coordinator, Jan 2015 - Mar 2016; Physics PDF Committee, Aug 2015 - Dec 2017; Annual Report Committee, Aug 2014 - present, Physics Approval Coordinator, Aug 2019 - present.
- Serving on the IMSc physics student-admissions interview panel, 2012 - present.
- Co-organizer of the “Pheno Club”, a discussion forum on recent papers, and pedagogical lectures for students, IMSc, Jan 2011 - June 2015.
- Coordinator (one of three) of standard model and beyond working group at WHEPP-XIII, Puri, India, Dec 2013.
- Coordinator of “Frontiers of High Energy Physics” (FHEP), IMSc Golden Jubilee Symposium, a 4-day event in which 16 internationally renowned speakers reviewed the status of the field to inform the Indian HEP community, including about 50 students and young researchers from across India, IMSc, December 10 - 13, 2012.
- Served on the National Advisory Committee for the National Conference on Particle Physics and Cosmology, University of Burdwan, March 2011.

- Discussion leader in Warped-space Phenomenology sub-group at WHEPP-XI, PRL Ahmedabad, Jan 2010.
- Co-organizer of High Energy Physics Seminar Series at: Michigan State Univ., Fall 2003 and Spring 2004. Brookhaven HET/RIKEN seminar series Oct 2007 - Sep 2008.
- World Year of Physics outreach event to area high school students, co-organized modern physics demonstrations, Northwestern Univ., May 2005.
- Referee for the following journals: Pramana, Physical Review Letters, Physical Review D, Physics Letters B, International Journal of Theoretical Physics, International Journal of Modern Physics A.

## Other Educational Training

- Participant, Theoretical Advanced Study Institute (TASI-2001), “Strings, Branes and Extra dimensions.”, Univ. of Colorado, Boulder (June 2001).
- Participant, Summer School in “CP violation in and beyond the standard model.” Stanford Linear Accelerator Center (July 1999).

## Computing Skills

- Proficient in C, C++, Fortran; Familiar with programming in a distributed/parallel computing environment.
- Expertise in Monte-Carlo simulation of new physics processes in Pythia, MadGraph, CalcHEP and CompHEP. Familiarity with Pandora.
- Proficient in: Symbolic and numerical computation in Mathematica; Algebraic manipulation programs Form and FeynCalc; Loop integral evaluation using LoopTools (in Mathematica); Familiar with analysis package ROOT.
- Implemented numerous graphics (ray tracing) and image processing algorithms.

## Research and Development Work

- Familiarity with the resistive plate chamber reconstruction software, and, Monte-Carlo simulation for BaBar, under the guidance of Dr. Doug Wright, Lawrence Livermore Lab (1997-98).
- Developed a real-time visualization software using the CUMULVS package based on the PVM protocol, useful in high performance computing, under the guidance of Dr. Alice Koniges, Lawrence Livermore Lab (1996-97).
- Conceived, designed and built a continually online trained artificial neural network for real-time control using a digital signal processor (TMS320C30), under the guidance of Prof. Juan Balda, M.S. project work, Department of Electrical Engineering, Univ. of Arkansas, Fayetteville (1994-1996).
- Part of a team that designed and built an image processing sub-system using a digital signal processor (ADSP 2100) as part of a real-time feedback control system, Systems Engineer, Microcon Instruments and Systems, Bangalore, India (1993).

- Designed and built an Intel-8085 based data acquisition system and joystick controller, B.E. project work under the guidance of Dr. Seshadri, Aeronautical Development Establishment, Bangalore, India (1991-1992).

**List of Publications is in a separate document.**

**List of Talks presented and Conferences attended is in a separate document.**