CURRICULUM VITAE

Personal Information:

Name: Sabyasachi Mukherjee

Date of Birth: 4th February, 1986

Nationality: Indian

Official Address: School of Mathematics, Tata Institute of Fundamental Research, 1 Homi Bhabha Road, Colaba, Mumbai 400005, India

Email: sabya@math.tifr.res.in, mukherjee.sabya86@gmail.com

Phone: (+91) 2222782218

Employment:

- Current position: Reader at Tata Institute of Fundamental Research, India since July 2019.
- Previous position: Lecturer in Institute for Mathematical Sciences, Stony Brook University, USA (2015-2019).

Academic Information:

1. 2007 : Bachelor of Science (Mathematics, Physics, and Computer Science) from University of Calcutta, India.
2. 2009 : Master of Science (Pure Mathematics) from University of Calcutta, India.
3. 2011 : 'Master mention Mathématiques et Informatique' (Masters in Mathematics and Informatics) from Université Paris 13, France.
4. 2015 : Ph.D. in Mathematics from Jacobs University Bremen, Germany.

Ph.D. thesis:

Title:

Antiholomorphic dynamics: topology of parameter spaces, and discontinuity of straightening.

Ph.D. adviser:

Dierk Schleicher, Jacobs University, Bremen, Germany.

Jury:

John Hamal Hubbard (Cornell University), Alan Huckleberry (Ruhr-Universität Bochum/Jacobs University), Hiroyuki Inou (Kyoto University), Keivan Mallahi-Karai (Jacobs University), John Milnor (Stony Brook University), Dierk Schleicher (Jacobs University).

M.Sc. dissertation:

Title:

A detailed proof of Melnikov's theorem on persistence of lower-dimensional tori in nearly integrable Hamiltonian systems, and deduction of the classical KAM theorem.

Adviser of M.Sc. dissertation:

Ricardo Perez-Marco, Université Paris 13, Paris, France.

Research Interest:

Conformal dynamics, complex analysis.

Papers/Pre-prints:

1. Orbit portraits of unicritical antiholomorphic polynomials, *Conformal Geometry and Dynamics of the AMS*, 19:35–50, 2015.
   http://www.ams.org/journals/ecgd/2015-19-03/S1088-4173-2015-00276-3/.

2. Non-landing parameter rays of the Multicorns (joint work with Hiroyuki Inou), *Inventiones Mathematicae*, 204(3):869–893, 2016.
   http://link.springer.com/article/10.1007/s00222-015-0627-3.

3. Rational parameter rays of Multibrot sets (joint work with Dierk Schleicher and Dominik Eberlein), *Dynamical Systems, Number Theory and Applications*, chapter 3, pages 49–84, World Scientific, 2016.
   http://dx.doi.org/10.1142/9789814699877_0003.

4. On Multicorns and Unicorns II: bifurcations in spaces of antiholomorphic polynomials (joint work with Dierk Schleicher and Shizuo Nakane), *Ergodic Theory and Dynamical Systems*, 37:859–899, 2017.
   http://journals.cambridge.org/abstract_S0143385715000656.

5. Parabolic arcs of the Multicorns: real-analyticity of Hausdorff dimension, and singularities of $\mathrm{Per}_n(1)$ curves, *Discrete and Continuous Dynamical Systems-A*, 37:2565–2588, 2017.
   http://www.aimsciences.org/article/doi/10.3934/dcds.2017110.

6. Antiholomorphic perturbations of Weierstrass Zeta functions and Green's function on tori (joint work with Konstantin Bogdanov, Khudoyor Mamayusupov, and Dierk Schleicher), *Nonlinearity*, 30:3241–3254, 2017.
   https://doi.org/10.1088/1361-6544/aa79cf.

7. A rigidity result for some parabolic germs (joint work with Luna Lomonaco), *Indiana University Mathematics Journal*, 67:2089-2101, 2018.
   http://www.iumj.indiana.edu/oai/2018/67/7459/7459.xml.

8. On the support of the bifurcation measure of cubic polynomials (joint work with Hiroyuki Inou), *Mathematische Annalen*, 378:1-12, 2020.
   https://link.springer.com/article/10.1007/s00208-019-01826-3.

9. Invisible Tricorns in real slices of rational maps (joint work with Russell Lodge), *Discrete and Continuous Dynamical Systems-A*, 41:1755-1797, 2021.
   https://www.aimsciences.org/article/doi/10.3934/dcds.2020340.

10. Discontinuity of straightening in anti-holomorphic dynamics: I (joint work with Hiroyuki Inou), *Transactions of the American Mathematical Society*, 374:6445-6481, 2021. https://doi.org/10.1090/tran/8381.

11. Schwarz reflections and anti-holomorphic correspondences (joint work with Seung-Yeop Lee, Mikhail Lyubich, and Nikolai Makarov), *Advances in Mathematics*, 385:107766, 2021. https://doi.org/10.1016/j.aim.2021.107766.

12. Univalent polynomials and Hubbard trees (joint work with Kirill Lazebnik and Nikolai Makarov), *Transactions of the American Mathematical Society*, 374:4839-4893, 2021. https://doi.org/10.1090/tran/8387.

13. Bers slices in families of univalent maps (joint work with Kirill Lazebnik and Nikolai Makarov), *Mathematische Zeitschrift*, 300:2771-2808, 2022. https://doi.org/10.1007/s00209-021-02871-y.

14. Circle packings, kissing reflection groups, and critically fixed anti-rational maps (joint work with Russell Lodge and Yusheng Luo), *Forum of Mathematics, Sigma*, vol. 10, e3, 2022. https://doi.org/10.1017/fms.2021.81.

15. Discontinuity of straightening in anti-holomorphic dynamics: II (joint work with Hiroyuki Inou), *International Mathematics Research Notices*, 2022(9):6948–6990, 2022. https://doi.org/10.1093/imrn/rnaa365.

16. Combination theorems in groups, geometry and dynamics (joint work with Mahan Mj), In *In the tradition of Thurston II* (edited by K. Ohshika and A. Papadopoulos), Springer, 2022. https://doi.org/10.1007/978-3-030-97560-9_10.

17. On deformation space analogies between Kleinian reflection groups and antiholomorphic rational maps (joint work with Russell Lodge and Yusheng Luo), *Geometric and Functional Analysis*, 32:1428–1485, 2022. https://doi.org/10.1007/s00039-022-00621-8.

18. On dynamical gaskets generated by rational maps, Kleinian groups, and Schwarz reflections (joint work with Russell Lodge, Mikhail Lyubich, and Sergei Merenkov), *Conformal Geometry and Dynamics of the AMS*, 27:1–54, 2023. https://doi.org/10.1090/ecgd/379.

19. Combining rational maps and Kleinian groups via orbit equivalence (joint work with Mahan Mj), *Proceedings of the London Mathematical Society*, 126:1740–1809, 2023. https://doi.org/10.1112/plms.12517.

20. The Sullivan dictionary and Bowen-Series maps (joint work with Mahan Mj), *EMS Surveys in Mathematical Sciences*, 10:179–221, 2023. https://doi.org/10.4171/EMSS/70.

21. Dynamics of Schwarz reflections: the mating phenomena (joint work with Seung-Yeop Lee, Mikhail Lyubich, and Nikolai Makarov), *Annales Scientifiques de l'École Normale Supérieure (Quatrième Série)*, 56:1825–1881, 2023. https://doi.org/10.24033/asens.2568.

22. Schwarz reflections and the Tricorn (joint work with Seung-Yeop Lee, Mikhail Lyubich, and Nikolai Makarov), to appear in *Annales de l'Institut Fourier*. https://arxiv.org/abs/1812.01573.

23. David extension of circle homeomorphisms, welding, mating, and removability (joint work with Mikhail Lyubich, Sergei Merenkov, and Dimitrios Ntalampekos), to appear in *Memoirs of the American Mathematical Society*.
`https://arxiv.org/abs/2010.11256`.

24. Antiholomorphic correspondences and mating I: realization theorems (joint work with Mikhail Lyubich and Jacob Mazor).
`https://arxiv.org/abs/2303.02459`.

25. Matings, holomorphic correspondences, and a Bers slice (joint work with Mahan Mj).
`https://arxiv.org/abs/2304.12699`.

26. Mirrors of conformal dynamics: Interplay between anti-rational maps, reflection groups, Schwarz reflections, and correspondences (joint work with Mikhail Lyubich).
`http://arxiv.org/abs/2310.03316`.

Awards/Fellowships:

1. Fellowship for M.Math. at Indian Statistical Institute, Bangalore, India, 2007 (declined the offer).

2. Fellowship for Integrated Ph.D. in Applicable Mathematics at Tata Institute of Fundamental Research, Bangalore, India, 2007 (declined the offer).

3. Fellowship for Ph.D. in Mathematics at Tata Institute of Fundamental Research, Mumbai, India, 2009 (declined the offer).

4. Fellowship for Ph.D. in Mathematics at Institute of Mathematical Sciences, Chennai, India, 2009 (declined the offer).

5. Fellowship for Ph.D. in Mathematics from National Board of Higher Mathematics, India, 2009.

6. 'Bourses d'excellence' for Research Masters in Mathematics from Université Paris 13, France, 2010.

7. Full scholarship for Ph.D. in Mathematics at University of Toronto, Canada, 2012 (declined the offer).

8. Full scholarship (Overseas Research Scholarship) for Ph.D. in Mathematics at University of Surrey, England, 2012 (declined the offer).

9. Fellowship for Ph.D. in Mathematics from German Research Council DFG (Grant name: Antiholomorphic Dynamical Systems and Real Slices, PI: Dierk Schleicher), Germany, 2013.

10. Start-up grant from Science and Engineering Research Board, India, 2020-22.

11. MATRICS grant from Science and Engineering Research Board, India, 2023-26.

Seminar/Conference Talks:

1. 'Thermodynamic formalism and Hausdorff dimension of some Julia sets I', Jacobs University, Bremen, Germany, September 2012.

2. 'Thermodynamic formalism and Hausdorff dimension of some Julia sets II', Jacobs University, Bremen, Germany, September 2012.

3. Poster presentation on ‘Combinatorics and topology of the multicorns’, International Centre for Mathematical Sciences, Edinburgh, UK, May 2013.

4. ‘Combinatorics and topology of the multicorns’, Universitat de Barcelona, Spain, June 2013.

5. ‘Antiholomorphic dynamics and the multicorns’, Ramakrishna Mission Vivekananda University, Calcutta, India, August 2013.

6. ‘Antiholomorphic dynamics and parameter spaces of polynomials’, Centro di Ricerca Matematica Ennio De Giorgi, Pisa, Italy, October 2013.

7. ‘Non-landing parameter rays of the multicorns’, Jacobs University, Bremen, Germany, March 2014.

8. ‘Non-landing parameter rays of the Tricorn’, Universität Bremen, Germany, April 2014.

9. ‘On the topological differences between the Mandelbrot set and the Tricorn’, Higher School of Economics, Moscow, Russia, May 2014.

10. ‘On the topological differences between the Mandelbrot set and the Tricorn’, Banach Center Conferences, Będlewo, Poland, July 2014.

11. ‘On the topological differences between the Mandelbrot set and the Tricorn’, Sominestationen, Holbaek, Denmark, September 2014.

12. ‘Hausdorff dimension of Julia sets on boundaries of hyperbolic components’, Jacobs University, Bremen, Germany, September 2014.

13. ‘The topological differences between the Mandelbrot set and the Tricorn’, The University of Warwick, Coventry, UK, November 2014.

14. ‘The topological differences between the Mandelbrot set and the Tricorn’, The Open University, UK, November 2014.

15. ‘Discontinuity of the straightening map in antiholomorphic dynamics’, Ramakrishna Mission Vivekananda University, Calcutta, India, January 2015.

16. ‘Discontinuity of the straightening map in antiholomorphic dynamics’, Banff International Research Station, Banff, Canada, April 2015.

17. ‘Local-global principles for polynomial parabolic germs’, Jacobs University, Bremen, Germany, April 2015.

18. ‘Non-landing parameter rays of the Tricorn’, Stony Brook University, USA, April 2015.

19. ‘Antiholomorphic dynamics: umbilical cord wiggling, and discontinuity of the straightening map’, Stony Brook University, USA, September 2015.

20. ‘Antiholomorphic dynamics: discontinuity of the straightening map’, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing, China, October 2015.

21. ‘Connectedness loci of complex polynomials: beyond the Mandelbrot set’, Tata Institute of Fundamental Research, Mumbai, India, June 2016.

22. ‘Discontinuity of straightening in antiholomorphic dynamics’, University of Michigan, Ann Arbor, USA, November 2016.

23. ‘Connectedness loci of complex polynomials: beyond the Mandelbrot set’, Indian Institute of Science Education and Research, Kolkata, India, January 2017.

24. ‘Dynamics of Schwarz reflections: mating polynomials with groups’, Stony Brook University, USA, December 2017.

25. ‘Holomorphic dynamics and Newton’s method’, Presidency University, Calcutta, India, January 2018.

26. ‘Dynamics of Schwarz reflections: mating polynomials with groups’, Banach Center Conferences, Będlewo, Poland, March 2018.

27. ‘Dynamics of Schwarz reflections: mating polynomials with groups’, The University of Rhode Island, USA, April 2018.

28. ‘Dynamics of Schwarz reflections: mating polynomials with groups’, Cornell University, USA, April 2018.

29. ‘Dynamics of Schwarz reflections: mating polynomials with groups’, Northwestern University, USA, May 2018.

30. ‘Dynamics of Schwarz reflections: mating polynomials with groups’, Tata Institute of Fundamental Research, Mumbai, India, June 2018.

31. ‘Dynamics of Schwarz reflections: mating polynomials with groups’, University of Toronto, Canada, October 2018.

32. ‘Dynamics of Schwarz reflections: mating rational maps with groups’, The University of Alabama at Birmingham, USA, March 2019.

33. ‘Dynamics of Schwarz reflections: mating rational maps with groups’, Universitat de Barcelona, Spain, March 2019.

34. ‘Schwarz reflections and anti-holomorphic correspondences’, Stony Brook University, USA, May 2019.

35. ‘Dynamics of Schwarz reflections: mating rational maps with groups’, The Fields Institute, Toronto, Canada, May 2019.

36. ‘A new link between rational dynamics and Kleinian groups’, Indian Institute of Technology, Gandhinagar, India, November 2019.

37. ‘Univalent polynomials, and zeroes of harmonic polynomials’, Calcutta Mathematical Society, Calcutta, India, December 2019.

38. ‘A new link between rational dynamics and Kleinian groups’, Pontificia Universidad Católica de Chile, Santiago, Chile, January 2020.

39. ‘A new link between rational dynamics and Kleinian groups’, Stony Brook University, USA, March 2020.

40. ‘A new link between rational dynamics and Kleinian groups’, Tata Institute of Fundamental Research, Mumbai, India, May 2020.

41. ‘Reflection groups, anti-rational maps, and univalent functions’, Quasiworld Online Seminar (UCLA), July 2020.

42. 'The Fatou-Sullivan dictionary between Kleinian groups and rational maps', Virtual Math Fest, July 2020.

43. 'Fatou-Sullivan dictionary, matings, and Schwarz reflections', Colloquium, Stony Brook University, USA, September 2020.

44. 'Matings, correspondences, and Schwarz reflections', Dynamics and Renormalization Seminar, Stony Brook University, USA, September 2020.

45. 'Dynamics on the Riemann sphere', Berchmans Webinar Series, St. Berchmans College, Kerala, India, November 2020.

46. 'Combining rational maps and Kleinian groups via orbit equivalence', IISc Geometry and Topology seminar, April 2021.

47. 'Schwarz reflections, Shabat polynomials, and anti-holomorphic correspondences', Stony Brook University, USA, June 2021.

48. 'Conformal welding and combination theorems in conformal dynamics', Pre-conference Symposium, 36th Annual Ramanujan Mathematical Society Conference, India, August 2021.

49. 'Interbreeding in conformal dynamics, and its applications near and far', CIRM, Luminy, France, September 2021.

50. 'Deformation space analogies between Kleinian reflection groups and rational maps', Tata Institute of Fundamental Research, Mumbai, India, February 2022.

51. 'Combining rational maps and Kleinian groups via orbit equivalence', Indo-Japan workshop on surface groups and geometric structures, April 2022.

52. 'Deformation space analogies between Kleinian reflection groups and rational maps', MSRI, USA, May 2022.

53. 'Sullivan's no wandering domain theorem', 2022 Abel Prize Colloquium: Works of Dennis Sullivan, Tata Institute of Fundamental Research, Mumbai, India, May 2022.

54. 'Dynamics of algebraic correspondences and mating phenomena', University of Rochester, USA, June 2022.

55. 'David homeomorphisms in analysis and dynamics', Banach Center Conferences, Będlewo, Poland, August 2022.

56. 'Dynamics of algebraic correspondences and mating phenomena', IMPA, Brazil, November 2022.

57. 'Deformation space analogies between Kleinian reflection groups and rational maps', 37th Annual Ramanujan Mathematical Society Conference, Chennai, India, December 2022.

58. 'Combining rational maps and Kleinian groups via orbit equivalence', IIT Palakkad Mathematics Department Symposium, India, February 2023.

59. 'Conformal welding and combination theorems in holomorphic dynamics', Recent advances in Mathematics and its applications, University of Calcutta, India, March 2023.

60. 'Deformation space analogies between Kleinian reflection groups and rational maps', Chennai Mathematical Institute, India, April 2023.

61. 'Matings, holomorphic correspondences, and a Bers slice', Kyoto Dynamical Systems Seminar, Kyoto University, Japan, June 2023.

62. 'Matings, holomorphic correspondences, and a Bers slice', Conformal Dynamics and Groups Seminar, Peking University, China, June 2023.

63. 'Matings, holomorphic correspondences, and a Bers slice', 38th Annual Ramanujan Mathematical Society Conference, Guwahati, India, December 2023.

64. 'Combining rational maps and Kleinian groups as algebraic correspondences', Dynamics Seminar, University of Toronto, Canada, March 2024.

Mini-courses:

1. 'Quasiconformal maps in holomorphic dynamics', Kerala School of Mathematics, Kozhikode, India, February 2020.

2. 'Holomorphic dynamical systems', Indian Institute of Science Education and Research, Kolkata, India, November 2020.

3. 'Analysis and geometry on the complex plane', Vigyan Vidushi program, Tata Institute of Fundamental Research, Mumbai, India, July 2021.

4. 'Schwarz reflection maps and families of correspondences on the Riemann sphere', University of Rochester, USA, June 2022.

5. 'Introduction to complex analysis', Vigyan Vidushi program, Tata Institute of Fundamental Research, Mumbai, India, July 2022.

6. 'A tour of the Mandelbrot set', DMS Lecture Series, Indian Institute of Science Education and Research, Kolkata, India, September 2022.

7. 'Complex dynamics a la Fatou, Julia, Brolin, and Sullivan', Kerala School of Mathematics, Kozhikode, India, May 2023.

8. 'Fractals arising from antiholomorphic maps and reflection groups', Advanced Studies Institute in Analysis on Fractal Spaces & Dynamical Systems, Urgench State University, Uzbekistan, August, 2023.

Teaching:

1. Teaching assistant, 'Modern Mathematics - International Summer School for Students, 2013', Jacobs University Bremen.

2. Teaching assistant for the course 'ODE and dynamical systems' (instructor: Dierk Schleicher), Fall semester 2013, Jacobs University Bremen.

3. Teaching assistant for the course 'Introductory complex analysis' (instructor: Dierk Schleicher), Fall semester 2014, Jacobs University Bremen.

4. Teaching assistant for the course 'Topics in complex analysis- holomorphic dynamics and Kleinian groups' (instructor: Dierk Schleicher), Spring semester 2015, Jacobs University Bremen.

5. MAT 127: Calculus C (course instructor), Fall semester 2015, Stony Brook University, USA.

6. MAT 555: Introduction to dynamical systems (course instructor), Spring semester 2016, Stony Brook University, USA.
7. MAT 132: Calculus II (course instructor), Fall semester 2016, Stony Brook University, USA.
8. MAT 308: Differential Equations with Linear Algebra (course coordinator and instructor), Spring semester 2017, Stony Brook University, USA.
9. MAT 125: Calculus A (course instructor), Fall semester 2017, Stony Brook University, USA.
10. MAT 211: Introduction to linear algebra (course instructor), Spring semester 2018, Stony Brook University, USA.
11. MAT 127: Calculus C (course coordinator and instructor), Fall semester 2018, Stony Brook University, USA.
12. MAT 310: Linear algebra (course instructor), Spring semester 2019, Stony Brook University, USA.
13. Dynamical systems (graduate course), Fall semester 2020, Tata Institute of Fundamental Research, Mumbai, India.
14. Complex analysis (graduate course), Spring semester 2022, Tata Institute of Fundamental Research, Mumbai, India.

Organization/Outreach Activities:

1. Member of the local organizing committee of 'Modern Mathematics - International Summer School for Students', Jacobs University Bremen, July 2013.
2. Member of the local organizing committee and jury of '6th International Tournament of Young Mathematicians', Jacobs University Bremen, July 2014.
3. Member of the local organizing committee of 'Modern Mathematics - International Summer School for Students', Jacobs University Bremen, July 2015.
4. Member of the local organizing committee of 'Modern Mathematics - International Summer School for Students', Jacobs University Bremen, July 2017.
5. Organizer of the weekly dynamics seminar at Stony Brook University, Spring 2017-Spring 2019.
6. Instructor at Mathematics summer camp, Stony Brook University, July 2017.
7. Workshop co-instructor (with Mikhail Lyubich) at Sigma Camp, Connecticut, August 2017.
8. Instructor at Mathematics summer camp, Stony Brook University, July 2018.
9. Instructor at Sigma Camp, Connecticut, August 2018.
10. Coordinator of Visiting Students' Research Program, TIFR Mumbai, May-June 2020.
11. Mathematics colloquium organizer at TIFR Mumbai, Spring 2022–.
12. Organizer of one day online conference COGENT (Current Outlook on Geometry, Ergodic Theory and Number Theory), TIFR Mumbai, March 2022.
13. Math club talk on 'Sullivan's no wandering domain theorem', MathematiX Maths club, NISER, India, April 2022.

14. Organizer of 'TIFR International Colloquium on Randomness, Geometry and Dynamics', IISER Pune, India, January 2024.