

1. PERSONAL DATA

1. Current Address: Akad. G. Bonchev Street, block 8, Sofia 1113.
2. Born: Sofia, Bulgaria.
3. Citizenship: Bulgaria.
4. Email: rangachev@math.bas.bg
5. Homepage: <https://sites.google.com/view/arangachev/>

2. PROFESSIONAL PREPARATION

Massachusetts Institute of Technology
Northeastern University

Mathematics B.S., June 2011.
Mathematics Ph.D., May 2017.

Advisors: Prof. Terence Gaffney (NEU) and Prof. Steven Kleiman (MIT).

3. APPOINTMENTS

- Marie Skłodowska-Curie fellow, Institut de Mathématiques de Jussieu-Paris Rive Gauche and Centre National de la Recherche Scientifique, September 2023 - (present).
- Peter Beron fellow, Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, September, 2021 - August, 2023.
- Scientific Advisor at the International Center for Mathematical Sciences-Sofia, September, 2021 to present.
- L.E. Dickson Instructor of Mathematics, University of Chicago, 2017–2021.
- Mathematician, Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, 2008 - (present).

4. VISITING APPOINTMENTS

- IMJ-PRG and University of Paris, Visiting Scholar, Paris, France: September 2018, September 2019, November 2020, June–August 2021, April–May 2022, April–May 2023.
- IMPA, Visiting Scholar, Rio de Janeiro, Brazil, May–July 2015, July 2019.
- University of Vienna, Visiting Research Fellow, March–July 2009.
- Massachusetts Institute of Technology, Visiting Research Fellow, Jan-Feb. 2009.
- Steklov Mathematics Institute, Russian Academy of Sciences, Visiting Research Fellow, Dec. 2008.

5. GRANTS, AWARDS AND FELLOWSHIPS

- Marie Skłodowska-Curie grant GTSP-101111114 from the European Commission.
- “Peter Beron - Science and Innovation with Europe” grant [KP-06-D15-1] from the Bulgarian Science Fund, 2021–2023.
- Principal investigator, University of Chicago-IMJ (PRG) grant, “*Metric Geometry and Singularity Theory*,” 2020–2021. Collaborators: Bernard Teissier (IMJ-PRG), Hussein Mourtada (IMJ-PRG).
- Principal investigator, University of Chicago FACCTS grant, “*Conormal and Arc Spaces in the Deformation Theory of Singularities*,” 2018–2020. Collaborators: Bernard Teissier (IMJ-PRG), Hussein Mourtada (IMJ-PRG): <https://fcc.uchicago.edu/faccts-awards/>.
- Principal investigator, Office of the Provost Global Faculty Grant “*University of Chicago–IMPA collaboration in algebraic geometry*,” 2019–2020. Collaborators: Carolina Araujo (IMPA) and Eduardo Esteves (IMPA): <https://global.uchicago.edu/latin-america-awards-summary-2019-20>

- Starting grant from the Department of Mathematics at the University of Chicago, 2017–2021.
- American Mathematical Society ICM travel grant, 2018.
- The 2017 Recipient of the Dean of College of Science Award for Excellence in Research, for "outstanding research in the mathematics of singularities," Northeastern University, Boston, 2017. <https://cos.northeastern.edu/news/research-award-graduate-student-antoni-rangachev/>
- Member of the project Complex analysis, differential geometry and topology, Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, 2015–(present).
- College of Science Travel Grant, NEU, 2015–2016.
- Research Summer Fellowship, Department of Mathematics, NEU, 2015–2016.
- Ling Ma Fellowship, Department of Mathematics, NEU, 2014.
- Clay Mathematics Institute Fellowship, Clay Summer School on Resolution of Singularities, 2012.
- Undergraduate Research Opportunities Fellowships, MIT, 2008–2011.

6. PUBLICATIONS, PREPRINTS AND WORK IN PROGRESS

Work in Progress

- Mourtada, H., Rangachev, A., and Teissier, B., *Lipschitz geometry of quasi-ordinary singularities*.
- Rangachev, A., *Algebraic theory of continuity for meromorphic functions*.
- Rangachev, A., *Flat families of curves*.

Preprints

- Bengus-Lasnier, A., Gaffney, T., Rangachev, A., *A multiplicity formula for the Milnor number of a smoothable curve* (submitted). Accessible at <https://arxiv.org/abs/2310.16558>
- Rangachev, A., *Local Volumes, Equisingularity, and Generalized Smoothability* (submitted). Accessible at <https://arxiv.org/abs/2105.08749>.
- Gaffney, T. and Rangachev, A., *Pairs of modules and determinantal isolated singularities*, (submitted) Accessible at <https://arxiv.org/abs/1501.00201>.

Publications

- Rangachev, A., *A valuation theorem for Noetherian rings*, Michigan Math. Journal, vol. **73**, issue 4, 2023, 843–851.
- Rangachev, A., Marinov, G., Mladenov, M., *The impact and progression of the COVID-19 pandemic in Bulgaria in its first two years*, Vaccines **2022**, 10 (11): 1901. In the special issue "SARS-CoV-2 Variants Research and Ending the COVID-19 Pandemic".
<https://www.mdpi.com/2076-393X/10/11/1901/htm>
- Marinov, G., Mladenov, M., Rangachev, A., *SARS-CoV-2 reinfections during the first three major COVID-19 waves in Bulgaria*, PLoS ONE 17(9): e0274509.
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0274509>
- Rangachev, A., *The evolving notion of multiplicity*, Invited Address at the 51st Spring Conference of the Union of Bulgarian Mathematicians, Proceedings volume (2022), 101–111.
Accessible at https://drive.google.com/file/d/1PoAVD1jbn1Ygr0lK4mqquQDP7T4-_DjJ/view
- Rangachev, A., Marinov, G., and Mladenov, M., *The demographic and geographic impact of the COVID pandemic in Bulgaria and Eastern Europe in 2020*, Scientific Reports 12, Article number: 6333 (2022).
<https://www.nature.com/articles/s41598-022-09790-w>
Cited in the EU Committee of the Regions report "Regional differences in COVID-19 response: exposure and strategy".
- Rangachev, A., *Associated primes and integral closure of Noetherian rings*, Journal of Pure and Applied Algebra, **225** Issue 5, 2021. Accessible at <https://arxiv.org/abs/1907.10754>

- Gaffney, T. and Rangachev, A., *The A_f condition and relative conormal spaces for functions with non-vanishing derivative*, Int. J. Math., Vol. 30, No. 10 (2019), 12 pages.
Accessible at <https://arxiv.org/abs/1802.05338>.
- Rangachev, A., *Associated points and integral closure of modules*, Journal of Algebra, **508** (2018), 301–338.
Accessible at <https://arxiv.org/abs/1611.03910>
- Rangachev, A., *Local volumes, integral closure and equisingularity*, PhD Thesis, Northeastern University, 2017, 129 pg.
- Rangachev, A., *On the solvability of p -adic diagonal equations*, MIT UJM 8 2007, pp. 111–124.
Accessible at <https://math.uchicago.edu/~rangachev/local4.pdf>
- Dimitrov, V., and Rangachev, A., *Some sufficient conditions for the solvability of p -adic polynomial equations*, Proceedings of the Thirty Fourth Spring Conference of the Union of Bulgarian Mathematicians, 2005, pp. 102–107.
Accessible at http://www.math.bas.bg/smb/2004_2007_PK/2005/pdf/102-107.pdf

7. SELECTED INVITED TALKS

1. *The Milnor number of a smoothable curve*, ICMS-Sofia Seminar, Sofia, January 2024.
2. *Stratified Morse theory and the critical locus of a linear functional*, ICMS-Sofia Seminar, Sofia, January 2024.
3. *How to parameterize a variety?* University of Chicago Center in Paris, April, 2023.
4. *The demographic and geographic impact of the COVID-19 pandemic in Bulgaria*, „COVID-19 in 20-22” conference, Sofia, September 2022.
5. *Bi-Lipschitz equivalence of quasi-ordinary singularities*, Singularities Seminar, University of Paris, May 2022.
6. *Relative normalization*, AMS Spring Sectional Meeting, Purdue University, March 2022.
7. *The evolving notion of multiplicity as an invariant in singularity theory*, Invited Address at 51st Spring Conference of the Union of Bulgarian Mathematicians, Tryavna, Bulgaria, April 2022.
8. *The evolving notion of multiplicity as an invariant in singularity theory*, Kleiman’s 80th birthday conference, IMPA, Brazil, March 2022.
9. *The special fiber of a conormal space*, Iberoamerican Webinar in Singularity Theory, January 2022.
10. *A valuation theorem for Noetherian rings*, Algebra and Logic Seminar, IMI-BAS, January 2022.
11. *Rigidity and Generalized Smoothability*, International Conference Geometry and Homological Mirror Symmetry, Sochi, December 2021.
12. *Integral closure and Lipschitz geometry* Metric geometry and Singularities, University of Paris & University of Chicago Center in Paris, May-June 2021.
13. *Rigidity in dimension 2*, First Annual Meeting of Young Bulgarian Mathematicians, International Center for Mathematical Sciences - Sofia, May 2021.
14. *Rigidity and Smoothness*, Algebraic Geometry Seminar, University of Chicago, May 2021.
15. *Rigidity in dimension 2*, Réunion annuelle du GDR singularités et applications, Université de Paris, November 2020.
16. *Generalized smoothability*, Algebraic Theory of Singularities, IMPA, Rio de Janeiro, March 2020.
17. *Algebraic theory of continuity for meromorphic functions*, Department of Analysis, Geometry and Topology Seminar, Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, December 2019.
18. *Lipschitz geometry and Zariski equisingularity*, Hyperplane Arrangements and Singularities. Memorial Conference for Stefan Papadima, University of Tokyo, December 2019.
19. *Algebraic theory of continuity for meromorphic functions*, Algebraic geometry seminar, University of Chicago, November 2019.
20. *Generalized Smoothability*, Algebraic geometry and commutative algebra seminar, University of Notre Dame, November 2019.
21. *Equisingularity and generalized smoothability*, Algebraic geometry seminar, Purdue, October 2019.
22. *Lipschitz geometry and Zariski equisingularity*, Geometry and Topology Seminar, University of Chicago, October 2019.

23. *Generalized smoothability*, Singularities Seminar, IMJ-PRG, Paris, September 2019
24. *Lipschitz geometry of quasi-ordinary singularities*, Singularities Seminar, Institut Mathématique de Marseille, Aix-Marseille Université, Marseille, France, September 2019.
25. *Generalized Smoothability*, Non-isolated singularities and derived geometry, a celebration of David Massey's 60th birthday, UNAM, Cuernavaca, Mexico, August 2019.
26. *Thom's transversality and generalized smoothability*, IMPA, Rio de Janeiro, July, 2019.
27. *Local volumes, equisingularity, and generalized smoothability*, Northwestern University Algebraic Geometry Seminar, May, 2019.
28. *Local volumes, equisingularity, and generalized smoothability*, UIC Algebraic Geometry Seminar, May, 2019.
29. *Asymptotics of intersection numbers and the local volume of a line bundle*, AMS Sectional Meeting, Special Session on Multiplicities and Volumes: An Interplay among Algebra, Combinatorics, and Geometry, University of Michigan, Ann Arbor, Oct. 2018
30. *Asymptotics of intersection numbers and deficient conormal singularities*, 15th International workshop on real and complex singularities, Sao Carlos, Brazil, 23rd July, 2018, Satellite Conference of the ICM.
31. *Deficient conormal singularities and local volumes*, AMS Sectional Meeting, Boston, April 2018.
32. *Deformations of isolated singularities and local volumes*, Singularities Seminar, IMJ-PRG, Paris, Nov. 2017.
33. *Deformations of isolated singularities and local volumes*, Route 81 Conference, Cornell University, Ithaca, Oct. 2017.
34. *Restricted local volumes and deformation theory*, AG seminar, University of Chicago, Oct. 2016.
35. *Restricted local volumes and deformation theory*, World Wide Center of Mathematics, Oct. 2016, video available on youtube.
36. *Local Volumes and Deformations*, Interactions in Geometry, international conference in honor of Johan Davidov and Oleg Mushkarov, Bulgarian Academy of Sciences, August, 2016.
37. *Local Volumes and Equisingularity*, AG seminar, Princeton University, Oct. 2015
38. *Deformation theory of multiplicities and applications*, IMPA, Rio de Janeiro, June 2015.
39. *The epsilon multiplicity and polar varieties*, 13th International workshop on real and complex singularities, Sao Carlos, Brazil, August, 2014.
40. *The epsilon multiplicities and polar varieties*, Maurice Auslander Distinguished Lectures and International Conference, Woods Holes, USA, May 2014.
41. *John Milnor and his contribution to differential topology and singularity theory*, National Colloquium of Mathematics, Bulgarian Academy of Sciences, Nov. 2011.
42. *Equisingularity Theory of Complex Analytic Families*, Steklov Mathematical Institute, Russian Academy of Sciences, Dec. 2008.

8. SYNERGISTIC ACTIVITIES AND SERVICE

- Referee for Compositio Mathematica, Journal of Algebraic Geometry, Annales de l'institut Fourier, Indagationes Mathematicae. Reviewer for Mathematical Reviews.
- Organizer of the international conference "Metric Geometry and Singularities" at the University of Paris and the UChicago Center in Paris, May-June 2021.
- Organizer with Oleg Mushkarov of the annual conference "Young Bulgarian Mathematicians" held at IMI-BAS and ICMS-Sofia.
- Gave a series of lectures on resolution of singularities at the University of Chicago REU program, June 2019.
- Taught with B. Teissier a month long course on geometry and topology of singularities, University of Chicago, April 2019.
- Organizer of the algebraic geometry seminar at the University of Chicago, 2017–2021.
- Organizer of the ICMS-Sofia seminar, 2021- (present).
- Opening address at the North American "Maths en Jeans" conference, Lycee Francais de Chicago, April 2018.
https://www.mathenjeans.fr/sites/default/files/congres/chicago_bilan_congres_math-en-jeans_2018.pdf

- President of the Mathematics Graduate Student Association, Northeastern University, 2014–2016, re-elected in 2015.
- Graduate Student Senator representing the NEU Math Department at the Graduate Student Government, 2016–2017.
- Member of the Graduate Student Council at the Office of the Dean of the College of Science at NEU, 2014–2016.
- Lecturer and mentor at the Research Summer School for high school students in mathematics and computer science, HSSIMI, Bulgarian Academy of Sciences, 2006–2017.
- Mentored over 20 high school projects in combinatorics, algebraic number theory, geometry and representation theory, Bulgarian Academy of Sciences, 2006–2017.
- Academic Tutor, Research Science Institute, MIT, June–August, 2013.

9. TEACHING

- Average score from teaching evaluations at University of Chicago and Northeastern University: 95/100.
- Undergraduate Algebraic Geometry, University of Chicago, Winter 2020.
- Algebra I and II, University of Chicago, 2017–2020.
- Instructor and Teaching Assistant for calculus classes at Northeastern University 2014–2016.
- Teaching Assistant for Commutative Algebra (graduate course) and Seminar in Algebra and Number Theory (advanced undergraduate course) at MIT, 2009–2010.

10. SUPERVISION

- Andrei Bengus-Lsnier, Postdoc at IMI-BAS (joint with Oleg Mushkarov).
- Huynh P. N. Le, MSc student at the Vietnam National University-HCMC, 2022.

11. REFERENCES

T. Gaffney (NEU), S. Kleiman (MIT), S. Kovács (UW), B. Teissier (IMJ-PRG), D. Massey (NEU), M. Nori (UChicago), B. Ulrich (Purdue); teaching: Robert Fefferman (UChicago).

12. MISCELLANEOUS

Languages spoken (in decreasing competence): Bulgarian (native); English (fluent); Russian (good); French (beginner).