Curriculum Vitæ

Bojan Mohar

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Born: September 21, 1956 (Slovenia)

Citizenship: Canada and Slovenia

Research Interests: Mathematics, Graph Theory, Combinatorics, Theoretical Computer Science.

Highest Scientific Degree: Ph. D. in Mathematics, University of Ljubljana (1986).

Teaching and Research Positions

- 2004– Tier 1 Canada Research Chair, Simon Fraser University.
- 1996– Professor, University of Ljubljana. 1991–1996 Associate Prof. 1988–1991 Assistant Prof.
- Short term visiting positions (1–12 months): Professeur Invité, École normale supérieure, Paris (2016). McGill University, Montreal (2002). Directeur d'études invité, EHESS, Paris (2002). Technische Universität Ilmenau, Germany (1998). Georgia Institute of Technology, Atlanta (1996/97). Visiting Fulbright Scholar, Ohio State University, Columbus (1988). Postdoctoral Fellow, Simon Fraser University (1986/87).

Selected Invited Plenary Talks

BM is regularly an invited plenary speaker at international meetings (43 plenary talks from 2010–18). Below is a list of selected keynote presentations.

1993 Graphs on Surfaces, Johns Hopkins University, Baltimore, MD.

1996 Graph symmetry: Algebraic methods and applications, University of Montréal.

1998 5th Czech-Slovak Intern. Symp. on Combinatorics, Graph Theory, Algorithms & Appl., Prague.

2000 6th International Conference on Graph Theory, Marseille-Luminy, France.

2001 18th British Combinatorial Conference, Sussex, Brighton, UK.

2004 2004 NZIMA Conference in Combinatorics & Appl. and 29th Australasian Conference in Combinatorial Mathematics and Combinatorial Computing (29th ACCMCC), New Zealand.

2007 Combinatorics and Optimization (at) 40, University of Waterloo.

2008 Topological & Geometric Graph Theory, Paris, France.

2008 SIAM Conference on Discrete Mathematics (SIAM DM'08), Burlington, VT.

2009 EuroComb 2009, European Conference on Combinatorics, Graph Theory and Applications, France.

2010 35th International Symposium on Mathematical Foundations of Computer Science, Joint MFCS & CSL 2010, Brno, Czech Republic.

2013 7th Czech-Slovak Intern. Symp. Graph Theory, Combinatorics, Algorithms & Appl., Košice, Slovakia.

2014 International Colloquium on Graph Theory and Combinatorics (ICGT2014), Grenoble.

2014 ICM 2014 Satellite Conference on Extremal and Structural Graph Theory, Gyeongju, South Korea.

2015 European Workshop on Computational Geometry (EuroCG), Ljubljana, Slovenia.

2016 40th Australasian Conf. Combinatorial Math. and Combinatorial Computing, Newcastle, Australia.

2017 6th Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM 2017), Toronto, ON.

2018 26th International Symposium on Graph Drawing and Network Visualization, GD 2018, Barcelona, Spain.

Editorial Boards

- Editor-in-Chief: Journal of Combinatorial Theory, Ser. B (2015–), Electronic Journal of Combinatorics (2013–).
- Managing or Associate Editor: SIAM Journal on Discrete Mathematics (2011–2014). Discrete Mathematics (2007–). Journal of Graph Theory (2004–2011).
- Editorial Board Member: Tbilisi Mathematical Journal (2015–). Discrete and Computational Geometry (2014–). Ars Mathematica Contemporanea (2007–2016). Linear and Multilinear Algebra (2005–2015). Journal of Graph Theory (2011–). Journal of Combinatorial Theory, Ser. B (1999–2014). MATCH (2002–).

Organization of an international conference

- Slovenian Graph Theory Conference series: Workshop on algebraic and topological methods in graph theory (1991). 3rd–8th Slovenian International Graph Theory Conference (1995, 1999, 2003, 2007, 2011, 2015). Recent Trends in Graph Theory, Algebraic Combinatorics, and Graph Algorithms (2001).
- Banff International Research Station (BIRS): Topological graph theory and crossing numbers (2006). Infinite Graphs (2007). Graph Minors (2008). New trends in structural graph theory (2010). Geometric and Topological Graph Theory (2013). New Trends in Graph Coloring (2016). Geometric and Structural Graph Theory (2017).
- CanaDAM 2007, 1st Canadian Discrete and Algorithmic Mathematics Conference, Banff, AB (Chair of the Organizing Committee).
- Workshop on the Cycle Double Cover Conjecture, PIMS UBC&SFU, 2007.
- The University of Alaska Winter School (2014).
- SIAM Conference on Discrete Mathematics (2014), Minneapolis (Chair of the Organizing Committee).
- Member of Program and Scientific Committees: Graph Drawing '99, Prague. Information Society 2004 – Theoretical Computer Science (IS04-TCS), Ljubljana. SIAM Conference on Discrete Mathematics 2006, Victoria, BC. Topological & Geometric Graph Theory, Paris, 2008. Groups and Infinite Graphs, Vienna, Austria, 2008. Workshop on Spectral Graph Theory, Rio de Janeiro, 2008. Tomo is Sixty, Ljubljana, 2009. 36th International Workshop on Graph-Theoretic Concepts in Computer Science, 2010, Crete. Eurocomb 2011, Budapest, Hungary. ACM-SIAM Symposium on Discrete Algorithms (SODA'12), Kyoto, Japan, 2012. Conference on Algorithms and Discrete Appl. Math. (CALDAM): Kanpur, 2015; Kerala, 2016; Goa 2017; Guwahati, 2018. 41st International Workshop on Graph-Theoretic Concepts in Computer Science, Munich, 2015. EuroComb 2015, Bergen, Norway. IPM Combinatorics and Computing Conference (2015). Topics in Theoretical Computer Science (TTCS 2015). ACM-SIAM Symposium on Discrete Algorithms (SODA'19), 2019. EuroComb 2019. CanaDAM 2019.

Students (Ph.D.)

Martin Juvan (1995). France Dacar (1995). Riste Škrekovski (2000). Gašper Fijavž (2001). Drago Bokal (2006). Janez Povh (coadvisor, 2006). Andrej Vodopivec (2007). Ararat Harutyunyan (2011). Lino Demasi (2012). Petr Škoda (2012). Azhvan Ahmady (2013). Krystal Guo (2015). David Gajser (2015) (co-advisor). Ross Churchley (2017). Current students: Nathan Singer, Seyyed Aliasghar Hosseini, Sebastián González, Abhinav Shantanam, Yifan Jing.

Postdoctoral Students

Sergio Cabello, 2004–06 (Marie Curie Fellow). Matt DeVos, 2004 and 2005–08. Robert Šámal, 2006–08 (PIMS PDF). Simon Špacapan, 2008. Zdeněk Dvořák, 2008–09. Guillaume Chapuy, 2009–10 (PIMS-CNRS Fellowship). Diego Scheide, 2010. Jessica McDonald, 2010–12 (NSERC PDF). Roi Krakovski, 2011–12. Andrew King, 2011–12 (PIMS PDF). Hehui Wu, 2013–14 (PIMS Fellowship). Arash Rafiey, 2012–13. Seyed Saeed Changiz Rezaei, 2014–15 (MITACS Accelerate). Fiachra Knox, 2014–17 (PIMS PDF 2015-17). Suil O, 2015–16. Jernej Azarija, 2016–17.

Executive Posts

- Dean of the Faculty of Mathematics and Physics, University of Ljubljana (2003–05)
- Executive Council of the Engineering Academy of Slovenia, 2001–2005.
- Chair of Slovenian Baccalaureate Committee for Mathematics, 1999–2000.
- Vice Chair of the SIAM Activity Group on Discrete Mathematics (SIAG/DM), 2008–09.
- Chair of the Denes Konig Prize selection committee, 2010.
- NSERC Evaluation Group (Mathematics), 2011–2014.
- NSERC Scholarships and Fellowships Selection Committee for Mathematical Sciences, 2016–19. Chair of the committee 2018–19.
- NSF Panel member (several years).
- Chair of the SIAM Activity Group on Discrete Mathematics (SIAG/DM), 2018–19.

Honors, Special Grants, Academies

- John L. Synge Award (by the Royal Society of Canada), awarded in 2018.
- SIAM Fellow 2018.
- Euler Medal (Institute of Combinatorics and its Applications), 2010.
- Ambassador of Science Award (Republic of Slovenia), 2009.
- Elected to the International Academy of Mathematical Chemistry (IAMC), 2008.
- Discovery Accelerator Supplement (NSERC), 2008–2010.
- Canada Research Chair, Tier I, 2005–2012; extended 2012–2019.
- Elected to The Engineering Academy of Slovenia in 1999.
- Boris Kidrič Prize (Slovenian National Prize for Science), 1990.
- Fulbright Grant (1988).

Citation data

- Number of citations (Google Scholar, August 28, 2018): 10712
- h-index (Google Scholar, August 28, 2018): 45
- i10-index (Google Scholar, August 28, 2018): 164
- h-index (Web of Science, August 2018): 32

Most significant works

BM has published more than 250 journal publications, 45 refereed conference papers, 8 books or book chapters.

He has three influential reference works. The monograph with Carsten Thomassen about graphs on surfaces [B. M. and C. Thomassen, Graphs on Surfaces, Johns Hopkins Univ. Press, 2001] has become a standard book on this subject. He wrote a survey on spectra of infinite graphs [B. M. and W. Woess, A survey on spectra of infinite graphs, Bull. London Math. Soc. 21 (1989) 209-234] at the time of his PhD and this paper from 1989 is still a basic reference for this area. In the 1990's, the paper about the Laplacian spectrum of graphs [B.M., The Laplacian spectrum of graphs, in "Graph Theory, Combinatorics, and Applications", Vol. 2, Wiley, 1991, 871-898] made the bridge between the mathematical community and theoretical computer science, where Laplacian eigenvalues became one of the fundamental techniques. This paper has 200+ citations by MathSciNet and around 1500 citations by Google Scholar. The large number of citations outside MathSciNet shows how important it became outside of mathematics. Whole generations of computer scientists have adopted everything from the results to basic notation and terminology introduced in this paper.

Most important research contributions (in reverse chronological order):

- Z. Dvorak, B. Lidicky, B. Mohar, 5-choosability of graphs with crossings far apart, J. Combin. Theory, Ser. B 123 (2017) 54–96. This paper solves a (strengthening of a) conjecture of Albertson. The techniques were then applied in another deep paper [Z. Dvorak, B. Lidicky, B. Mohar, L. Postle, 5-list-coloring planar graphs with distant precolored vertices, J. Combin. Theory, Ser. B 122 (2017) 311–352].
- B. Mohar, H. Wu, Dichromatic number and fractional chromatic number, Forum of Mathematics, Sigma 4 (2016) e32, 14 pages. A fractional version of an old conjecture of Erdős and Neumann-Lara from 1979 is solved in this contribution.
- B. Mohar, Median eigenvalues of bipartite subcubic graphs, Combinatorics, Probability and Computing 25 (2016) 768–790. BM introduced a totally new approach to the study of median eigenvalues of graphs, whose importance comes from a HOMO-LUMO separation problem in Chemistry. In this paper, a surprising result is proved that the median eigenvalues of all connected subcubic bipartite graphs are between -1 and 1 with a single exception of the Heawood graph, whose median eigenvalue is $\sqrt{2}$.
- M. DeVos, Z. Dvorak, J. Fox, J. McDonald, B. Mohar, and D. Scheide, A minimum degree condition forcing complete graph immersion, Combinatorica 34 (2014) 279-298. It is shown that every n-vertex graph without a K_t immersion has only $O(tn)$ edges.
- S. Cabello, B. Mohar, Adding one edge to planar graphs makes crossing number and 1-planarity hard, SIAM J. Comput. 42 (2013) 1803-1829. The results of this paper shattered the theory of crossing numbers as it is proved that by adding a single edge to a planar graph, computing the crossing number of the resulting graph is NP-hard. Around the same time another highly unexpected result that crossing-critical graphs may look quite different than everyone expected was obtained [Z. Dvorak, B. Mohar, Crossing-critical graphs with large maximum degree, J. Combin. Theory B 100 (2010) 413–417].
- G. Chapuy, E. Fusy, O. Gimenez, B. Mohar, M. Noy, Asymptotic enumeration and limit laws for graphs of fixed genus, J. Combin. Theory, Ser. A 118 (2011) 748–777. Novel contribution to enumeration of graphs on surfaces.
- E. D. Demaine, M. Hajiaghayi, B. Mohar, Approximation algorithms via contraction decomposition, Combinatorica 30 (2010) 533-552. This work (originally presented at SODA07) gives a powerful meta-theorem that can be used to obtain polynomial time approximation schemes for a large collection of optimization problems in minor-closed families of graphs. These include all problems whose objective function is monotone with respect to edge-contraction, an important example being the Traveling Salesman Problem.
- M. DeVos, L. Goddyn, B. Mohar, A generalization of Kneser's Addition Theorem, Adv. Math. 220 (2009) 1531-1548. This work provides a common generalization of two fundamental but previously unrelated results from additive number theory and additive combinatorics, Kneser's Addition Theorem and the Erdos-Ginzburg-Ziv Theorem and its generalizations. The main result of this contribution is a powerful theorem that has numerous consequences and generalizes a vast number of results in additive number theory.
- T. Bohme, K. Kawarabayashi, J. Maharry, B. Mohar, Linear connectivity forces large complete bipartite minors, J. Combin. Theory B 99 (2009) 557-582. The paper may be a landmark in structural graph theory. The main theorem is the first result of its kind. It is proved that for every fixed t, every $16t$-connected graph G contains the complete bipartite graph $K_{t,k}$ as a minor (where k is arbitrarily large) as long as G is large enough (in terms of t and k). This result has several fundamental consequences. In particular, it implies the constant factor approximation for Hadwiger's Conjecture.
- K. Kawarabayashi, B. Mohar, Graph and map isomorphism and all polyhedral embeddings in linear time, Proc. 40th annual ACM Symposium on Theory of Computing, ACM, 2008, pp. 471-480. It is proved that the isomorphism problem is solvable in linear time for graphs of bounded genus under an additional condition of polyhedrality. The proofs are based on an older result of BM on the flexibility of embeddings and on deep results from structural graph theory.
- M. DeVos, B. Mohar, An analogue of the Descartes-Euler formula for infinite graphs and Higuchi's conjecture, Trans. Amer. Math. Soc. 359 (2007) 3287-3300. Resolves Higuchi conjecture about combinatorial curvature of embedded graphs.

- M. DeVos, L. Goddyn, B. Mohar, D. Vertigan, X. Zhu, Coloring-flow duality of embedded graphs, Trans. AMS 357 (2005) 3993-4016. Unified theory of (circular) coloring of graphs on surfaces.
- B. Mohar, N. Robertson, Flexibility of polyhedral embeddings of graphs in surfaces, J. Combin. Theory B 83 (2001) 38-57 and B. Mohar, Uniqueness and minimality of large face-width embeddings of graphs, Combinatorica 15 (1995) 541-556. These papers give an ultimate generalization of Whitney's rigidity theorem from planar to polyhedral maps on an arbitrary surface.
- B. Mohar, A linear time algorithm for embedding graphs in an arbitrary surface, SIAM J. Discrete Math. 12 (1999) 6-26. This is the most appraised result of BM. The proofs are long and complicated and use support of five other papers, all together around 150 pages. This paper gives the first constructive proof of the fact that for every surface there is only a finite number of minimal combinatorial obstructions. The proof involves the study of more general embedding extension problems and implies a linear-time algorithm, for every fixed surface S, to test if a given graph can be embedded in S. Conceptually simpler (but practically intractable) linear-time algorithm based on graph minors theory has been uncovered later in [K. Kawarabayashi, B. Mohar, B. Reed, A simpler linear time algorithm for embedding graphs into an arbitrary surface and the genus of graphs of bounded tree-width, FOCS, 2008, pp. 771–780].