

Rahim Nazim Moosa

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Education

Ph.D. in Mathematics University of Illinois at Urbana-Champaign, 2001
Thesis: *Contributions to the Model Theory of Fields and Compact Complex Spaces*
Advisor: Anand Pillay

B.ArtsSc. (Hons.) McMaster University, 1996

Academic Positions

Professor University of Waterloo *July 2015 – present*

Visiting Researcher Fields Institute, Toronto *July–December 2021*

CARMIN Visiting Researcher IHES and IHP, Paris *January–July 2018*

Associate Professor University of Waterloo *July 2009 – June 2015*

Member MSRI, Berkeley *January–May 2014*

Scientific Member Max Planck Institute, Bonn, Germany *April–June 2012*

Assistant Professor University of Waterloo *July 2004 – June 2009*

Programme Participant Isaac Newton Inst., Cambridge, UK *May–July 2005*

CLE Moore Instructor MIT *July 2002 – June 2004*

NSERC Postdoctoral Fellow Fields Institute *July 2001 – June 2002*

Visiting Assistant Professor UC Berkeley *August 2001 – May 2002*

Individual Grants Awarded

NSERC Discovery Grants *2005– present*

Current: \$135,000 (2021–2026)

Past: \$100,000 (2015–2021), \$120,000 (2010–2015), \$80,000 (2005–2010)

NSERC Discovery Accelerator Supplement \$120,000 *2015–2018*

Editorial Positions

Founding **Editor-in-Chief** *Model Theory* 2021 –

Associate Editor
Canadian Journal of Math and Canadian Math Bulletin 2021 –

Reviews Editor *The Bulletin of Symbolic Logic* 2011 –

Research Interests

Model theory (a branch of mathematical logic).
Especially interactions with algebra and geometry.

Articles Under Review

38. *Bounding nonminimality and a conjecture of Borovik-Cherlin*
(with J. Freitag), Submitted, 22 pages.

37. *Effective isotrivial Mordell-Lang in positive characteristic*
(with J. Bell and D. Ghioca), Submitted, 42 pages.

Refereed Publications

36. *Model theory and the DME: a survey*. To appear in
Research Trends in Contemporary Logic (Eds M. Fitting et al), 17 pages.

35. *Invariant hypersurfaces* (with J. Bell and A. Topaz)
To appear in the *Journal de l'Institut de Mathématiques de Jussieu*, 25 pages.

34. *Internality of logarithmic-differential pullbacks* (with R. Jin)
Transactions of the American Mathematical Society, 373 (7):4863–4887, 2020.

33. *F-sets and finite automata* (with J. Bell)
Journal de Théorie des Nombres de Bordeaux, 31 (1):101–130, 2019.

32. *Isolated types of finite rank: an abstract Dixmier-Moeglin equivalence*
(with O. León Sánchez)
Selecta Mathematica, 25 (2019), number 1, Art.10, 10pp.

31. *Functoriality and uniformity in Hrushovski's groupoid-cover correspondence*
(with L. Haykazyan)
Annals of Pure and Applied Logic, 169 (8):715–730, 2018.
30. *D-groups and the Dixmier-Moeglin equivalence* (with J. Bell and O. León Sánchez)
Algebra & Number Theory, 12 (2):343–378, 2018.
29. *Finiteness theorems on hypersurfaces in partial differential-algebraic geometry*
(with J. Freitag)
Advances in Mathematics, 314:726–755, 2017.
28. *Model theory of compact complex manifolds with an automorphism*
(with M. Bays and M. Hils)
Transactions of the American Mathematical Society, 369(6):4485–4516, 2017.
27. *Poisson algebras via model theory and differential-algebraic geometry*
(with J. Bell, S. Launois, and O. Leon Sanchez)
Journal of the European Mathematical Society, 19(7):2019–2049, 2017.
26. *The model companion of differential fields with free operators*
(with O. Leon Sanchez)
Journal of Symbolic Logic, 81(2):493–509, 2016.
25. *Differential-algebraic jet spaces preserve internality to the constants*
(with Z. Chatzidakis and M. Harrison-Trainor)
Journal of Symbolic Logic, 80(3):1022–1034, 2015.
24. *A note on subvarieties of powers of OT-manifolds* (with M. Toma)
Bulletin de la Société des Sciences Mathématiques de Roumanie, 58(3):311–316, 2015.
23. *Model theory of fields with free operators in characteristic zero*
(with T. Scanlon)
Journal of Mathematical Logic, 2014, doi: 10.1142/s0219061314500093. 38 pages
22. *Some model theory of fibrations and algebraic reductions* (with A. Pillay)
Selecta Mathematica, 20(4):1067–1082, 2014
21. *Countably categorical strongly minimal compact complex manifolds*
(with A. Pillay)
Proceedings of the American Mathematical Society, 140(5):1785–1801, 2012
20. *Nonstandard methods for bounds in differential polynomial rings*
(with M. Harrison-Trainor and J. Klys)
Journal of Algebra, 360:71–86, 2012

19. *A model-theoretic counterpart to Moishezon morphisms*
In *Models, Logics and Higher-Dimensional Categories: A Tribute to the Work of Mihály Makkai*, (Eds. B. Hart et al), CRM Proceedings and Lecture Notes
American Mathematical Society, 53:177–188, 2011
18. *Generalised Hasse-Schmidt varieties and their jet spaces* (with T. Scanlon)
Proceedings of the London Math. Society, 103(2):197–234, 2011
17. *Model theory and complex geometry* (Feature article, invited submission)
Notices of the American Mathematical Society, 57(2):230–235, 2010
16. *Jet and prolongation spaces* (with T. Scanlon)
Journal de l’Institut de Mathématiques de Jussieu, 9(2):391–431, 2010
15. *On canonical bases and internality criteria* (with A. Pillay)
Illinois Journal of Mathematics, 52(3):901–917, 2008
14. *An essentially saturated surface not of Kähler-type*
(with R. Moraru and M. Toma)
Bulletin of the London Mathematical Society, 40(5):845–854, 2008
13. *Differential arcs and regular types in differential fields*
(with A. Pillay and T. Scanlon)
Journal für die reine und angewandte Mathematik, 620:35–54, 2008
12. *K-analytic vs CCM-analytic sets in nonstandard compact complex manifolds*
(with S. Starchenko), Fundamenta Mathematicae, 198(2):139–148, 2008
11. *Model Theory and Kähler Geometry* (with A. Pillay)
Model Theory with Applications to Algebra and Analysis Vol. 1
(Eds. Z. Chatzidakis et al), Cambridge University Press, 167–195, 2008
10. *Stable definability and generic relations* (with B. Kim)
Journal of Symbolic Logic, 72(4):1163–1176, 2007
9. *Division points on subvarieties of isotrivial semiabelian varieties* (with D. Ghioca)
International Mathematics Research Notices, Article ID 65437, 23 pages, 2006
8. *Strongly minimal groups in the theory of compact complex spaces*
(with M. Aschenbrenner and T. Scanlon)
Journal of Symbolic Logic, 71(2):529–552, 2006
7. *On saturation and the model theory of compact Kähler manifolds*
Journal für die reine und angewandte Mathematik, 586:1–20, 2005
6. *The model theory of compact complex spaces.* *Logic Colloquium ’01*
(Eds. M. Baaz et al), Association for Symbolic Logic, 317–349, 2005

5. *A nonstandard Riemann existence theorem*

Transactions of the American Mathematical Society, 356(5):1781–1797, 2004

4. *F-structures and integral points on semi-abelian varieties over finite fields*

(with T. Scanlon)

American Journal of Mathematics, 126(3):473–522, 2004

3. *The Mordell-Lang conjecture in positive characteristic revisited*(with T. Scanlon), *Model Theory and Applications* (Eds. L. Bélair et al),

Seconda Università di Napoli, 275–296, 2002

2. *On difference fields with quantifier elimination*

Bulletin of the London Mathematical Society, 33(6):641–646, 2001

1. *A note on uniform definability and minimal fields of definition*

Journal of Symbolic Logic, 65(2):817–821, 2000

Invited Participation at **Institute Workshops**

Fields Institute Toronto

Trends in Pure and Applied Model Theory

*July 1 – December 31, 2021***Institut Henry Poincaré** Paris, France

Model Theory and Applications

*March 26–30, 2018***Luminy** CIRM, FranceAlg., Arith. and Comb. of Difference/Differential Equations *May 28–June 1, 2018*Model Theory, Difference/Differential Equations and Applications *April 7–10, 2015*

The Geometry of the Frobenius Automorphism

March 25–29, 2013

MODNET workshop on Model Theory of Fields

*November 12–16, 2007***Oberwolfach** Mathematisches Forschungsinstitut, Germany

Model Theory: groups, geometries and combinatorics

January 2020

Model Theory: groups, geometry, and combinatorics

January 3–9, 2016

Around Valued Fields and Dependent Theories

January 3–9, 2010

Model Theory and Groups

January 14–20, 2007

Model Theory and Complex Analytic Geometry

*July 18–24, 2004***Durham Symposium** London Math. Society, United Kingdom

New Directions in the Model Theory of Fields

*July 20–30, 2009***BIRS** Alberta

Alg. Dynamics and Difference/Differential Eqns

Scheduled for Nov 2020

Stability Theoretic Methods in Unstable Theories

February 8–13, 2009

Interactions between Model Theory and Geometry

March 13–18, 2004

Invited **Talks** of the last five years

Ranked groups: The return

Université Claude Bernard Lyon 1, France
 “From Borovik-Cherlin to bounding nonminimality”

September 2021

North American Meeting of the ASL

Notre Dame University
 “Some model theory of automatic sets, I and II”

June 2021

Practical and Structural Model Theory

Passau, Germany

July 2020, cancelled

Model Theory Conference Karkonosze, Poland

June 2020, cancelled

Interactions between Representation Theory and Model Theory

University of Kent, United Kingdom
 “Model theory and the DME”

July 2019

Manchester Logic Seminar

“Pullbacks under the log derivative”

July 2019

Connections between Model Theory, Differential and Difference algebra, and their Applications, CUNY, New York

“Pullbacks under the log derivative”

March 2019

Pure and Applied Model Theory, University of Illinois at Chicago *October 2018* “Around Jouanolou-type Theorems”

Lyon Logic Seminar

“The groupoid-cover correspondence revisited”

June 2018

Groupe d'Etude sur les Problèmes Diophantiens Paris

“Isotrivial Mordell-Lang and finite automata”

June 2018

Algebra, Arith. and Combinatorics of Difference/Differential Equations

CIRM, Luminy, France

“Around Jouanolou-type Theorems”

May 2018

Géometrie et Théorie des Modèles Paris

“Isotrivial Mordell-Lang and finite automata”

May 2018

Model Theory and Applications Institut Henri Poincaré, Paris

“ D -varieties and the Dixmier-Moeglin equivalence”

March 2018

Oxford Logic Seminar

“Isotrivial Mordell-Lang and finite automata”

February 2018

Bridges between Automatic Sequences and Algebra and Number Theory CRM, Montreal, “ F -sets, Mordell-Lang, and automaticity”	<i>May 2017</i>
Joint Math. Meetings ASL Invited Address Atlanta, GA “An application of model theory to noncommutative algebra”	<i>January 2017</i>
Winter Meeting of the CMS Niagara Falls, Ontario Special Session on Mathematical Logic “An application of model theory to noncommutative algebra”	<i>December 2016</i>
Thematic Program in Model Theory Notre Dame “An application of model theory to Hopf Ore extensions”	<i>June 2016</i>
Differential Algebra Mini-Workshop CUNY, New York “The differential Dixmier-Moeglin problem”	<i>May 2016</i>

Supervisory Experience

Post-doctoral

Léo Jiminez	<i>2021–</i>
Dino Rossegger (co-supervisor)	<i>2019–2021</i>
Simon Crawford (co-supervisor)	<i>2018–2020</i>
Rémi Jaoui	<i>2017–2019</i>
Levon Haykazyan	<i>2016–2019</i>
Yi Zhu (co-supervisor)	<i>2015–2017</i>
Jonathon Stephenson (co-supervisor)	<i>2015–2017</i>
Alex Wires (co-supervisor)	<i>2013–2015</i>
Pantelis Eleftheriou	<i>2011–2013</i>
Javier Moreno	<i>2011</i>
Bernie Anderson (co-supervisor)	<i>2009–2011</i>
Moshe Kamensky	<i>2007–2009</i>

Doctoral

Christine Eagles	<i>2021–</i>
Christopher Hawthorne	<i>2017–2021</i>
Ruizhang Jin ¹	<i>2013–2019</i>
Thesis: <i>The Log Derivative and Model-Theoretic Analysability in DCF</i>	
Omar León Sánchez ²	<i>2008–2013</i>
Thesis: <i>Contributions to the model theory of partial differential fields</i>	

¹Winner of the faculty wide 2019 Huawei Prize for Best Research Paper

²Winner of the faculty-wide 2013 Murray Martin Prize for graduate research

Masters

Christine Eagles	2020–2021
Marco Handa	2019–2020
Wilson Poulter	2018–2019
Essay: <i>Zilber’s principle in practice</i>	
Hussein Ahmed (co-supervisor)	2017–2018
Essay: <i>Gödel’s 2nd incompleteness theorem and fragments of arithmetic</i>	
Christopher Hawthorne	2015–2016
Essay: <i>Formal languages and the model theory of finitely generated free monoids</i>	
Ruizhang Jin	2012–2013
Essay: <i>Canonical bases in stable theories</i>	
Daniel Ivan	2011–2012
Essay: <i>Existentially closed Hasse fields</i>	
Allen O’Hara	2010–2011
Essay: <i>An introduction to equations and equational theories</i>	
Chris Eagle	2008–2010
Thesis: <i>The Mordell-Lang theorem from the Zilber dichotomy</i>	

Undergraduate, NSERC

Austin Shiner (Spring 2020), Alexander Slamen (Spring 2020), Spencer Wilson (Fall 2019), Garret Hildebrandt (Spring 2019), Nicole Chassin (Spring 2016, Fall 2015), Michael Zhu (Winter 2016), Christopher Hawthorne (Spring 2013), Eeshan Wagh (Spring 2013), Yossef Musleh (Winter 2013), Chen Fei Du (Fall 2011), Matthew Harrison-Trainor³ (Spring 2010, Spring 2011), Jack Klys (Spring 2010), Oleg Chterental (Winter 2009), Richard Zsolt (Spring 2008), Elliot Lipnowski (Winter 2008), Wilson Kan (Spring 2006)

Undergraduate, Other

Shuo (Spencer) Gao (Spring 2020), Lirong Yang (Winter 2017, Winter 2015), Alan Yeung (CUHK, Spring 2016), Li Yan Lung (CUHK, Spring 2015)
Atul Sivaswamy (Spring 2009).

Doctoral Thesis Committees

Léo Jiminez, Notre Dame University (external examiner)	2020
Hongdi Huang, University of Waterloo Pure Math	2020
Michael Deveau, University of Waterloo Pure Math	2019
Mohammad Mahmoud, University of Waterloo Pure Math	2019
Blake Madill, University of Waterloo Pure Math	2017
Ian Payne, University of Waterloo Pure Math	2017
Tyrone Ghaswala, University of Waterloo Pure Math	2017
Diana Castenada (oral comp examiner), University of Waterloo Pure Math	2017
Matthew Luther, McMaster University, Math & Statistics (external reader)	2015

³Winner of the faculty-wide 2012 Jesse W.H. Zou Memorial Award for undergraduate research

Robert Garbary, University of Waterloo Pure Math	<i>2015</i>
Carolyn Knoll, University of Waterloo Pure Math	<i>2013</i>
Rohan Kapadia, University of Waterloo C&O (internal-external reader)	<i>2013</i>
James Frietag, University of Illinois at Chicago (external reader)	<i>2012</i>
Jean-Martin Albert, McMaster University (external reader)	<i>2010</i>
Dale Radin, University of Illinois at Chicago (external reader)	<i>2004</i>

Masters Essay/Thesis Committees

Jake Zimmerman (2018), Chris Dugdale (2014), David Peterson (2013),
Siwei Gao (2012), David Belanger (2009), Zi Yang Sham (2008),
Stephanie Kleven (2006)

Teaching at the University of Waterloo in the last five years

Topics in Logic: **Model theory of fields with operators** PMath 930
Winter 2021 (7 students), Fall 2019 (5 students)

Linear Algebra 2, advanced Math 245
Fall 2020 (32 students), Fall 2019 (44 students)

Set Theory and Model Theory PMath 733 (formerly 433/633)
Fall 2020 (37 students), Fall 2018 (28 students), Fall 2016 (24 students),
Winter 2015 (21 students), Fall 2012 (22 students), Fall 2010 (28 students),
Fall 2008 (37 students)

Introduction to Commutative Algebra PMath 446/646
Winter 2020 (21 students), Winter 2019 (30 students), Winter 2016 (18 students)

Algebra for Honours Mathematics Math 135
Winter 2019 (57 students), Fall 2017 (38 students), Winter 2017 (63 students),
Fall 2016 (51 students), Fall 2013 (175 students), Fall 2012 (162 students),
Fall 2011 (172 students), Winter 2011 (88 students), Fall 2009 (143 students),
Fall 2004 (140 students)

Groups and Rings PMath 347
Fall 2017 (52 students), Fall 2015 (36 students)

Topics in Algebra: **Valued Fields** PMath 900
Winter 2017 (17 students), Fall 2013 (16 students), Fall 2011 (18 students)

Service

Canadian Mathematical Society, Vice-President Ontario *2015–2017*
 CMS Ambassador *2018–*

Waterloo Committees

Departmental

Colloquium Chair, Department Advisory Committee on Appointments, Departmental Tenure and Promotions, Graduate Studies, Undergraduate Curriculum, Scholarships, Library Representative

Faculty

Working Group on Black and Indigenous Racism
 Faculty Working Group on Research, Creativity, and Innovation
 Research Advisory Committee; Nominating Committee for Chair

University

Faculty Association Departmental Representative; Academic Freedom and Tenure Committee; Hagey Lecture Committee (Chair); CEMC Advisory Committee on Appointments; PhD Defense Chair pool

Conference Organising Committees

Thematic Programme on Trends in Pure and Applied Model Theory
 Fields Institute *July–Dec 2021*
 Workshop on Model Theory of Differential Equations, Algebraic Geometry, and their Applications to Modeling, BIRS *May 2020*
 CMS Winter Meeting, Special Session on Model Theory
 Toronto *December 2019*
 Workshop on Recent Applications of Model Theory
 Fields Institute *July 2019*
 Model Theory Special Session, ASL Annual Meeting
 City University of New York *May 2019*
 CMS Winter Meeting, Special Session on Model Theory
 Waterloo *December 2017*
 Workshop on Differential Galois Theory and Differential Algebraic Groups
 Fields Institute *July 2017*
 Workshop on Model Theory and Arithmetic Dynamics
 Fields Institute *July 2016*
 Introductory Workshop (Chair), MSRI, Berkeley *February 2014*
 ASL Annual Meeting, Waterloo *May 2013*
 Model Theory Special Session, ASL Annual Meeting, Waterloo *May 2013*
 IMNA (Chair), Max Planck Institute for Mathematics, Bonn *June 2012*
 Recent Developments in Model Theory, Oléron, France *June 2011*
 ASL Annual Meeting, Notre Dame *May 2009*
 Model theory session of the CMS-MITACS Joint Conference, Winnipeg *June 2007*
 Greater Boston Logic Conference, MIT *May 2003*

Reviewer Mathematical Reviews

2015 –