Martin van Beek

Personal Information

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Education

September 2017 - July 2022 Defended December 2021	PhD in Pure Mathematics University of Birmingham Thesis: Local Group Theory, The Amalgam Method, and Fusion Systems Supervisor: Prof. Chris Parker
October 2016 - June 2017	Master of Advanced Study in Mathematical Sciences University of Warwick Classification: Masters with Distinction Thesis: Properties of the 7-Sphere Supervisor: Prof. Dmitriy Rumynin
September 2012 - July 2016	Bachelors of Science in Mathematics University of Glasgow Classification: Honours of the First Class Thesis: The Large Mathieu Groups Supervisor: Dr. Andrew Baker Awards: Dougall Prize 2015

Research Interests

I am currently interested in local group theory, specifically through the lens of saturated fusion systems over p-groups and their interactions with group amalgams. In fusion systems, my current research focuses on recognizing the p-fusion categories of simple groups of Lie type from prescribed local actions. Alongside this, I am interested in exotic fusion systems at odd primes, and the applications of fusion systems to representation theory and homotopy theory.

Employment

October 2022 - Present	Heilbronn Fellow at the University of Manchester The aim of this research is two-fold. Firstly, to work towards recognizing the p-fusion category of the groups of Lie type via the construction and recognition of parabolic systems in fusion systems, and ultimately to classify large families of fusion systems of parabolic characteristic p. Secondly, to uncover exotic fusion systems on p-groups, for p an odd prime, with the goal of identifying distinguishing features of exotic fusion systems when compared to p-fusion categories of finite groups.
November 2021 - October 2022	Research Associate at the University of Birmingham I was funded by the EPSRC for 12 months to facilitate research pertaining to saturated fusion systems. During this time, I discovered new exotic fusions systems which are related to sporadic simple groups, completely determined a large class of fusion systems supported on certain Sylow p-subgroups of a simple group of Lie type of rank two, and began the groundwork on describing fusion systems which contain a parabolic system.

Publications and Preprints

Books:

1. Rank 2 amalgams and fusion systems, $\sim$ 200 pp., (Arxiv), *Lecture Notes in Mathematics, Springer*, (2024)

Articles:

1. Fusion systems related to polynomial representations of $\mathrm{SL}_2(q)$, with Valentina Grazian, Chris Parker & Jason Semeraro, (Arxiv), *Submitted*
2. Lifting polynomial representations of $\mathrm{SL}_2(q)$ from $\mathbb{F}_p$ to $\mathbb{Z}/p^s\mathbb{Z}$, with Chris Parker, (Arxiv), *Submitted*
3. Fusion systems and simple groups with class two Sylow p-subgroups, (Arxiv), *Submitted*
4. Exotic fusion systems related to sporadic simple groups, (Arxiv), *Math. Proc. Camb. Phil. Soc*, (2025)
5. Fusion systems on Sylow p-subgroups of rank 2 simple groups of Lie type, (Arxiv), *Forum of Mathematics, Sigma*, (2024)
6. Fusion systems on a Sylow p-subgroup of $\mathrm{G}_2(p^n)$ or $\mathrm{PSU}_4(p^n)$, (Arxiv), *Journal of Algebra*, (2023)

Conferences and Seminars (Co-)Organized

Patterns in exotic fusion systems (Funded by the Heilbronn Institute)	-	Univ. of Birmingham	-	May 2023
Postgraduate group theory conference (Funded by the LMS and Heilbronn Institute)	-	Univ. of Birmingham	-	Jul. 2019

Funding

Heilbronn focused research grant (Joint with Prof. Chris Parker)	-	£6000	-	Mar. 2023

Selected Talks Given

Algebra Seminar *"Fusion systems and simple groups with class two Sylow p-subgroups"*	-	Univ. of Birmingham	-	Feb. 2025
Norddeutsches Gruppentheorie-Kolloquium *"Fusion systems and simple groups with class two Sylow p-subgroups"*	-	TU Dresden	-	Nov. 2024
Algebra Seminar *"Exotic fusion systems related to sporadic simple groups"*	-	Univ. of Warwick	-	Nov. 2023
Algebra Seminar *"Saturated fusion systems and rank two simple groups of Lie type"*	-	Univ. of Louisiana	-	Feb. 2023
Groups and Topological Groups Conference *"Saturated fusion systems and rank two simple groups of Lie type"*	-	Univ. Halle-Wittenberg	-	Feb. 2023
Algebra Seminar *"Fusion systems and rank 2 amalgams"*	-	Univ. of Manchester	-	Oct. 2022
Groups St Andrews *"Exotic fusion systems related to sporadic simple groups"*	-	Univ. of Newcastle	-	Aug. 2022
Groups, Representations and Applications *"Fusion systems and rank 2 amalgams"*	-	Isaac Newton Institute	-	July. 2022

Teaching

2024 — Lectured "Topics in Finite p-groups" at the University of Manchester

My responsibilities included devising the course, writing lecture notes, administering the lectures and problem sessions, and writing and marking the final exam. The audience was a mix between PhD students and postdocs.

2017 - 2021 — Postgraduate Teaching Assistant at the University of Birmingham

My responsibilities included leading and supporting in problem classes, and marking assignments and homework.

2017 - 2021 — Mathematics Support Centre Tutor at the University of Birmingham

My responsibilities included assisting undergraduates who were taking a wide range of courses in mathematics and other sciences, in a drop in session type environment.

Summer 2019 — A2B Supervisor at the University of Birmingham

My responsibilities included supervising the summer projects of various secondary school students transitioning to university, and marking the final projects.

Self Study, Interests and Hobbies

When I am not working I like strength training in my local gym. On top of this, I am a keen racket sports player, participating in and organizing weekly badminton and squash games. When the weather is nice, I enjoy playing football casually, and when the weather is not so nice, I spend more time in the swimming pool.

I am an enthusiastic drummer, having played regularly (and taught infrequently) since I was eight years old.