

Michael Rapoport



Academic career

1976	These d'Etat, University of Paris-Sud, France
1976 - 1980	Assistant Professor, HU Berlin
1982 - 1986	Professor (C3), University of Heidelberg
1986 - 1989	Professor (C3), University of Bonn
1989 - 1996	Professor (C4), University of Wuppertal
1996 - 2003	Professor (C4), University of Cologne
2003 - 2012	Professor (C4), University of Bonn
Since 2012	Professor (W3), University of Bonn

Honours

1991	Akademiestipendium of the VW-foundation
1992	Leibniz Prize
2000	Prix Gay-Lussac/Humboldt of the French Ministry of Education
2003	Member of the Leopoldina (German National Academy of Sciences)
2011	Heinz Hopf Prize
2012	Teaching prize of the University of Bonn
2013	Staudt Prize
2013	Member of the Academia Europaea

Invited Lectures

1993	Distinguished Ordway visitor in Mathematics, University of Minnesota, Minneapolis, MN, USA
1994	Invited speaker, International Congress of Mathematicians, Zürich, Switzerland
1995	Invited plenary speaker at Annual Conference of DMV, Ulm
2001	Distinguished Ordway visitor in Mathematics, University of Minnesota, Minneapolis, MN, USA
2011	Heinz Hopf Lectures, ETH Zürich, Switzerland

Research profile

My aim is to use algebraic geometry to establish higher reciprocity laws, which serve as a bridge between the field of arithmetic and the theory of automorphic forms. I am interested in the theory of Shimura varieties and their local variants, in particular Rapoport-Zink spaces. I am particularly fascinated by the possibility of constructing through them interesting Galois representations, of algebraic cycles on them and of deformations. My current research focusses on the following topics. I am interested in constructing arithmetic models of Shimura varieties through the correct formulation of a moduli problem whose solution gives such a model. For Shimura varieties attached to unitary groups this naturally leads to the problem of defining a crystalline discriminant of polarized p -divisible groups. So far, I have succeeded in this in the case of even height (joint work with S. Kudla). I am also interested in understanding the structure of natural stratifications of the reduction modulo p of integral models of Shimura varieties (the Newton stratification, the Ekedahl-Oort stratification, the Kottwitz-Rapoport stratification). In joint work with X. He, I have given an axiomatic framework for studying these questions. I am also interested in the Arithmetic Fundamental Lemma conjecture of W. Zhang. This conjecture predicts the intersection number of two arithmetic cycles of half-dimension on a Rapoport-Zink space. In joint work with U. Terstiege and W. Zhang I solved this conjecture in the minuscule case. Recently, in joint work with B. Smithling and W. Zhang, I extended the conjecture to ramified cases and solved it in a number of cases of small dimension.

In my future research I want to understand better the dependence of Rapoport-Zink spaces on the underlying group theory. My recent theorem with T. Zink on the Drinfeld moduli problem of

p -divisible groups deals in a special case related to GL_2 with the effect of changing the relevant cocharacter by a central cocharacter. In future work with S. Kudla and T. Zink, I want to treat the analogous problem for the group GU_2 and apply this to the p -adic uniformization of certain Shimura curves. I want to understand the influence of exceptional isomorphisms between orthogonal groups and unitary groups on their associated Rapoport-Zink spaces (which exist, due to recent work of B. Howard/G. Pappas and of W. Kim). Another topic I want to explore is the relation between the conjectures of S. Kudla and myself on arithmetic divisors on Rapoport-Zink spaces and the conjectures of W. Zhang on arithmetic cycles of half-dimension. I want to understand the impact of Scholze's ideas and methods on the study of integral models of Shimura varieties. I also want to return to the theory of Φ -modules which I started with G. Pappas and make progress after the recent contributions of M. Emerton/T. Gee.

Editorships

- Duke Math. J. (Associate Editor, 1995 - 2000)
- Ergebnisse der Mathematik, Springer Verlag (Editor, 1998 - 2003)
- International Mathematics Research Notices (Editor, since 2003)
- Algebra and Number Theory (Editor, since 2015)
- Epiga (Editor, since 2016)

Supervised theses

Master theses: 3

Diplom theses: 19

PhD theses: 14

Selected PhD students

Torsten Wedhorn (1998): "Ordinariness in Good Reductions of Shimura Varieties of PEL-Type",

now Professor, TU Darmstadt

Sascha Orlik (1999): "Kohomologie von Periodenbereichen",

now Professor, University of Wuppertal

Ulrich Görtz (2000): "On the flatness of certain Shimura varieties of PEL-Type",

now Professor, University of Duisburg-Essen

Eva Viehmann (2005): "On affine Deligne-Lusztig varieties for GL_n ",

now Professor, TU Munich

Ulrich Terstiege (2009): "Intersections of Arithmetic Hirzebruch-Zagier Cycles",

now Scientific Staff, RWTH Aachen

Eugen Hellmann (2011): "On arithmetic families of filtered f -modules and crystalline representations",

now Professor, University of Münster

Peter Scholze (2012): "Perfectoid Spaces",

now Professor (Hausdorff Chair), University of Bonn

Timo Richarz (2014): "On geometric Satake equivalences",

now Scientific Staff, University of Duisburg-Essen

Daniel Kirch (2015): "Construction of a Rapoport-Zink space for split $GU(1, 1)$ in the ramified 2-adic case",

now DFG-fellow, University of Paris VI, France

Andreas Mihatsch (2016): "Relative RZ-spaces and the Arithmetic Fundamental Lemma"

Habilitations

Torsten Wedhorn (2005)

Ulrich Görtz (2006)

Sascha Orlik (2007)

Eva Viehmann (2011)

Eugen Hellmann (2016)

Selected publications

- [1] Michael Rapoport, Ulrich Terstiege, and Wei Zhang. On the arithmetic fundamental lemma in the minuscule case. *Compos. Math.*, 149(10):1631–1666, 2013.
- [2] Stephen Kudla and Michael Rapoport. Special cycles on unitary shimura varieties i. unramified local theory. *Invent. Math.*, 184(3):629–682, 2011.
- [3] G. Pappas and M. Rapoport. ϕ -modules and coefficient spaces. *Mosc. Math. J.*, 9(3):625–663, back matter, 2009.
- [4] G. Pappas and M. Rapoport. Twisted loop groups and their affine flag varieties. *Adv. Math.*, 219(1):118–198, 2008. With an appendix by T. Haines and Rapoport.
- [5] Stephen S. Kudla, Michael Rapoport, and Tonghai Yang. *Modular forms and special cycles on Shimura curves*, volume 161 of *Annals of Mathematics Studies*. Princeton University Press, Princeton, NJ, 2006.
- [6] M. Rapoport and Th. Zink. *Period spaces for p -divisible groups*, volume 141 of *Annals of Mathematics Studies*. Princeton University Press, Princeton, NJ, 1996.
- [7] G. Laumon, M. Rapoport, and U. Stuhler. \mathcal{D} -elliptic sheaves and the langlands correspondence. *Invent. Math.*, 113(2):217–338, 1993.
- [8] Dan Burns, Jr. and Michael Rapoport. On the Torelli problem for Kählerian k -3 surfaces. *Ann. Sci. 'Ecole Norm. Sup. (4)*, 8(2):235–273, 1975.