

MATTHEW JAMES EMERTON

Curriculum Vitae — September 2014

University of Chicago  
Department of Mathematics  
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**Personal:**

Date of Birth: Nov. 9, 1971  
Birthplace: Canberra, ACT, Australia  
Citizenship: Australian  
Residency: United States

**Education:**

Harvard University: Ph.D., June 1998  
University of Melbourne: B.Sc. (Honours), November 1993

**Thesis:**

*2-adic modular forms of minimal slope*, May 1998  
(Adviser: Professor Barry Mazur, Harvard University)

**Awards:**

Alfred P. Sloan Foundation Doctoral Dissertation Fellowship, 1997-98 academic year  
Rackham School of Graduate Studies Summer Faculty Fellowship, Summer 1999

**Research Interests:**

Number Theory  
Representation Theory  
Algebraic Geometry

**Appointments:**

Professor  
Department of Mathematics, University of Chicago  
Chicago, Illinois, United States  
September 2011 – present

Arthur Anderson Teaching and Research Professor  
Northwestern University  
Evanston, Illinois, United States  
September 2010 – August 2011

Professor  
Department of Mathematics, Northwestern University  
Evanston, Illinois, United States  
September 2008 – August 2011

Associate Professor  
Department of Mathematics, Northwestern University  
Evanston, Illinois, United States  
September 2005 – August 2008

Assistant Professor  
Department of Mathematics, Northwestern University  
Evanston, Illinois, United States  
June 2001 – August 2005

Assistant Professor  
Department of Mathematics, University of Chicago  
Chicago, Illinois, United States  
July 2000 – June 2001

Assistant Professor  
Department of Mathematics, University of Michigan  
Ann Arbor, Michigan, United States  
September 1998 – July 2000

### Research Grants:

National Science Foundation award no. DMS-1303450

Project title:  $p$ -adic aspects of the Langlands program  
Project period: June 1, 2013 – May 31, 2016  
Principal investigator: Matthew Emerton  
Grant amount: \$320,000

National Science Foundation award no. DMS-1101503

Project title: Special meeting: Galois representations, Diophantine equations, and automorphic forms  
Project period: September 15, 2011 – August 31, 2012  
Principal investigator: Matthew Emerton  
Grant amount: \$80,000

National Science Foundation award no. DMS-1002339, DMS-1249548

Project title:  $p$ -adic aspects of the Langlands program  
Project period: June 1, 2010 – May 31, 2013  
Principal investigator: Matthew Emerton  
Grant amount: \$240,000

National Science Foundation award no. DMS-0636646

Project title: Geometry and physics  
Project period: February 2007 – February 2012.  
Principal investigators: Ezra Getzler, Boris Tsygan, Eric Zaslow  
Co-investigators: Kevin Costello, Matthew Emerton, Yuri Manin, David Nadler, Dimitri Tamarkin,  
Kari Vilonen, Jared Wunsch  
Grant amount: \$1,290,080

National Science Foundation award no. DMS-0701315

Project title:  $p$ -adic aspects of the Langlands program  
Project period: June 1, 2007 – May 31, 2010  
Principal investigator: Matthew Emerton  
Grant amount: \$186,002

National Science Foundation award no. DMS-0401545

Project title: Locally analytic representation theory and  $p$ -adic interpolation  
Project period: June 1, 2004 – May 31, 2007  
Principal investigator: Matthew Emerton  
Grant amount: \$185,904

National Science Foundation award nos. DMS-0070711, DMS-0296095, DMS-0241562

Project title: A  $p$ -adic Riemann-Hilbert correspondence  
Project period: July 1, 2000 – June 30, 2004  
Principal investigator: Matthew Emerton  
Grant amount: \$79,324

**Programs organized:**

Workshop on Cohomology of Shimura Varieties: Arithmetic Aspects and Construction of Galois Representations (with Laurent Clozel, David Geraghty, and Sug Woo Shin, Fields Institute, March 2012)

Thematic Program on Galois Representations (with Frank Calegari, Florian Herzig, Mark Kisin, and Steve Kudla, Fields Institute, January–June 2012)

Physics Mathematics Summer Institute (with Roman Bezrukavnikov, Ivan Cherednik, Patrick Delorme, Michael Douglas, Pavel Etingof, Anton Kapustin, Vladimir Kazakov, Maxim Kontsevich, Juan Maldacena, Barry Mazur, Ivan Mirkovic, Oleg Ogievetsky, Eric Opdam, Didina Serban, and Jean-Bernard Zuber, Luminy and Cargese, June–July 2011)

Conference on Current Developments and Directions in the Langlands Program (with Frank Calegari and Yuri Manin, Northwestern, May 2008)

Graduate Student Workshop on Representation Theory and Arithmetic (with Frank Calegari, Northwestern, May 2008)

Workshop on  $p$ -adic Variation of Motives (with Kevin Buzzard, Robert Coleman, and Eyal Goren, BIRS, December 2003)

**Students:**

Yun Cheng (Chicago, current)

Tianqi Fan (Chicago, current)

Sean Howe (Chicago, current)

Daniel Le (Chicago, current)

Chang Mou Lim (Chicago, current)

Jeff Manning (Chicago, current)

Drew Moore (Chicago, current)

Yiwei She (Chicago, current)

Yiwen Zhou (Chicago, current)

Chuangxun Cheng (Northwestern, 2011 Ph.D.)

Andrea Carter (Northwestern, 2006 Ph.D.)

Lisa Clay (Northwestern, 2005 Ph.D.)

**Postdocs Mentored:**

Brandon Levin (Chicago, 2014–present)

Ana Caraiani (Chicago, 2012–2013)

Davide Reduzzi (Chicago, 2012–present)

P. Edward Herman (Chicago, 2011–present)

Liang Xiao (Chicago, 2009–present)

Ellen Eischen (Northwestern, 2009–2012)

Bei Zhang (Northwestern, 2008–2011)

Florian Herzig (Northwestern, 2007–2010)

Toby Gee (Northwestern, 2007–2008)

**Publications:**

*Completed cohomology and the  $p$ -adic Langlands program*, to appear in the proceedings of the 2014 ICM, 26 pages.

*Patching and the  $p$ -adic local Langlands correspondence* (joint with Ana Caraiani, Toby Gee, David Geraghty, Vytautas Paškūnas, and Sug Woo Shin), available electronically at <http://math.uchicago.edu/~emerton/preprints.html>, 49 pages.

*Lattices in the cohomology of Shimura curves* (joint with Toby Gee and David Savitt), to appear in *Inventiones Mathematicae*, 96 pages.

*Hecke operators on stable cohomology* (joint with Frank Calegari), available electronically at <http://math.uchicago.edu/~emerton/preprints.html>, 10 pages.

*p*-adic Hodge-theoretic properties of étale cohomology with mod *p* coefficients, and the cohomology of Shimura varieties (joint with Toby Gee),

available electronically at <http://math.uchicago.edu/~emerton/preprints.html>, 43 pages.

*Local-global compatibility in the p-adic Langlands programme for  $GL_2/\mathbf{Q}$* , available electronically at <http://math.uchicago.edu/~emerton/preprints.html>, 116 pages.

*On a class of coherent rings, with applications to the smooth representation theory of  $GL_2(\mathbf{Q}_p)$  in characteristic *p**, available electronically at <http://math.uchicago.edu/~emerton/preprints.html>, 13 pages.

*A geometric perspective on the Breuil–Mézard conjecture* (joint with Toby Gee), to appear in the Journal of the Institute of Mathematics of Jussieu, 37 pages.

*Weight cycling and Serre-type conjectures for unitary groups* (joint with Toby Gee and Florian Herzig), Duke Mathematical Journal, vol. 162 (2013), 1649–1722.

*The local Langlands correspondence for  $GL_n$  in families* (joint with David Helm), to appear in Annales Scientifiques de L'École Normale Supérieure, 65 pages.

*Completed cohomology — A survey* (joint with Frank Calegari), in Nonabelian Fundamental Groups and Iwasawa Theory (John Coates, Minhyong Kim, Florian Pop, Mohamed Saidi, Peter Schneider eds.), London Mathematical Society Lecture Notes Series (No. 393), Cambridge University Press, 2011, 239–257.

*Mod-*p* cohomology growth in p-adic analytic towers of 3-manifolds* (joint with Frank Calegari), Groups, Geometry, and Dynamics, vol. 5 (2011), 355–366.

*p*-adic families of modular forms [after Hida, Coleman, and Mazur], Séminaire Bourbaki, 2009/2010, exposé 1013, Astérisque, vol. 339 (2011), 31–61.

*Jacquet modules of locally analytic representations of p-adic reductive groups II. The relation to parabolic induction*, to appear in the Journal of the Institute of Mathematics of Jussieu, 80 pages.

*On the effaceability of certain  $\delta$ -functors* (joint with Vytautas Paškūnas), Astérisque, vol. 331 (2010), 439–447.

*Ordinary parts of admissible representations of p-adic reductive groups II. Derived functors*, Astérisque, vol. 331 (2010), 383–438.

*Ordinary parts of admissible representations of p-adic reductive groups I. Definition and first properties*, Astérisque, vol. 331 (2010), 335–381.

*Bounds for multiplicities of unitary representations of cohomological type in spaces of cusp forms* (joint with Frank Calegari), Annals of Mathematics, vol. 170 (2009), 1437–1446.

*Représentations p-adiques ordinaires de  $GL_2(\mathbf{Q}_p)$  et compatibilité local-global* (joint with Christophe Breuil), Astérisque, vol. 331 (2010), 235–295.

*Elliptic curves of odd modular degree* (joint with Frank Calegari), Israel Journal of Mathematics, vol. 169 (2009), pp. 417–444.

*Locally analytic representation theory of p-adic reductive groups: A summary of some recent developments*, in *L*-functions and Galois representations (D. Burns, K. Buzzard and J. Nekovář, eds.), London Mathematical Society Lecture Note Series, vol. 320, 2007, 407–437.

*A report on the AIM working group on mod p local Langlands*, available electronically at <http://www.aimath.org/WWN/padicmodularity>, 6 pages.

*A local-global compatibility conjecture in the p-adic Langlands programme for  $GL_2/\mathbf{Q}$* , Pure and Applied Mathematics Quarterly, vol. 2 (2006), no. 2 (Special issue: In honour of John Coates' 60th birthday, part 2 of 2), pp. 279–393.

*Jacquet modules of locally analytic representations of p-adic reductive groups I. Construction and first properties*, Annales Scientifiques de L'École Normale Supérieure, vol. 39 (2006), 775–839.

*On the interpolation of systems of eigenvalues attached to automorphic Hecke eigenforms*, Inventiones Mathematicae, vol. 164 (2006), pp. 1–84.

*Variation of Iwasawa invariants in Hida families* (joint with Robert Pollack and Tom Weston), Inventiones Mathematicae, vol. 163 (2006), pp. 523–580.

*p*-adic *L*-functions and unitary completions of representations of *p*-adic reductive groups, Duke Mathematical Journal, vol. 130 (2005), 353–392.

*Locally analytic vectors in representations of locally p-adic analytic groups*, to appear in Memoirs of the American Mathematical Society, 139 pages.

*On the ramification of Hecke algebras at Eisenstein primes* (joint with Frank Calegari), Inventiones Mathematicae, vol. 160 (2005), pp. 97–144.

*A geometric Jacquet functor* (joint with David Nadler and Kari Vilonen), Duke Mathematical Journal, vol. 125 (2004), pp. 267–278.

*An introduction to the Riemann-Hilbert correspondence for unit *F*-crystals* (joint with Mark Kisin), in Geometric aspects of Dwork theory (A. Adolphson, etc., eds.), vol. II, Walter de Gruyter, Berlin and New York, 2004, pp. 677–700.

*The Riemann-Hilbert correspondence for unit *F*-crystals* (joint with Mark Kisin), Astérisque, vol. 293 (2004), 251 pages.

*The Hecke algebra  $\mathbf{T}_k$  has large index* (joint with Frank Calegari), Mathematical Research Letters, vol. 11 (2004), 125–137.

*Optimal quotients of modular Jacobians*, Mathematische Annalen, vol. 327 (2003), 429–458.

*Supersingular elliptic curves, theta series and weight two modular forms*, Journal of the American Mathematical Society, vol. 15 (2002), 671–714.

*An introduction to the *p*-adic geometry of modular curves*, appendix to F. Q. Gouvêa, Deformations of Galois representations, in Arithmetic Algebraic Geometry (B. Conrad and K. Rubin, eds.), IAS/Park City Mathematics Series, vol. 9, 2001, 377–398.

*Unit *L*-functions and a conjecture of Katz* (joint with Mark Kisin), Annals of Mathematics, vol. 153 (2001), 329–354.

*The Eisenstein ideal in Hida's ordinary Hecke algebra*, International Mathematics Research Notices (1999) no. 15, 793–802.

*A new proof of a theorem of Hida*, International Mathematics Research Notices (1999) no. 9, 453–472.

*Extensions of crystalline representations* (joint with Mark Kisin), Preprintreihe, SFB 478 - Geometrische Strukturen in der Mathematik, 1999, 50 pages.

#### **Selected Invited Talks:**

*Completed cohomology and the *p*-adic Langlands program*, International Congress of Mathematicians, Seoul, August 2014

*An overview of the *p*-adic Langlands program*, Gelfand Centennial Conference, MIT, August/September 2013  
**p*-adic families of modular forms [after Hida, Coleman, and Mazur]*, Séminaire Bourbaki, Paris, November 2009

*Topology, representation theory, and arithmetic: Three-manifolds and the Langlands program*, Current Events Bulletin, Joint Mathematics Meeting, Washington DC, January 2009