William A. Stein – Curriculum Vitae – April 2016

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Employment
- **University of Washington**: Prof. of Math. (tenured), 2010–present.
- **University of Washington**: Assoc. Prof. of Math. (tenured), 2006–2010.
- **UC San Diego**: Assoc. Prof. of Math. (tenured), 2005–2006.
- **Harvard University**: Benjamin Peirce Asst. Prof. of Math., 2001–2005.
- **Harvard University**: NSF Postdoctoral Fellow, 2000–2004.

Education
- **University of California at Berkeley**, Ph.D. in Mathematics, 2000, *Explicit Approaches to Modular Abelian Varieties*, under H. W. Lenstra.
- **Northern Arizona University**, B.S. in Mathematics, 1994.

Prizes
- **Richard Dimick Jenks Memorial Prize** for Excellence in Software Engineering applied to Computer Algebra, 2013.
- **Tropheés du Libre**. The Sage project won first prize in 2007 in Scientific Software (3000 euros, a laptop, books, server space, etc.). Sage is a software project I started and direct.

Grants
- co-PI on **NSF Grant**, DMS-7098841, *Sage-combinat: Developing and sharing open source software for algebraic combinatorics*, 2012–2015.
- PI on **NSF Grant**, DMS-7180474, *Explicit Approaches to Elliptic Curves and Modular Abelian Varieties*, 2012–2015.
- co-PI on **NSF Grant**, DMS-1062253, *REU: Inverse Problems for Electrical Networks*, 2011–2014.
- co-PI on **NSF Grant**, DMS-1020378, *Collaborative Research: UTMOST: Undergraduate Teaching in Mathematics with Open Software and Textbooks*, undergraduate curriculum development, 2011–2014.
- PI on **DOD Grant**, four Sage Bug-fixing workshops per year and other development support, 2011–2016 (pending yearly renewal).
- PI on **NSF Grant** DMS-1015114, *Sage: Unifying Mathematical Software for Scientists, Engineers, and Mathematicians*, four Sage Days workshops per year, 2011–2014.
- UW Royalty Research Fellow (1-quarter teaching buyout), 2009–2010.
- PI on **NSF Grant** DMS-0821725, SCREMS grant for number theory, geometry, and software research ($100K, purchased high end computers for UW).
- PI on **Google Grant**, for Sage development, Summer 2008 (amount: $18K).
- PI on **Microsoft Grant**, port Sage to Windows, 2008–2009 (amount: $32K).
- PI on **NSF Grant** DMS-0757627, *FRG: Collaborative Research: L-functions and Modular Forms*, 2008–2012 (amount: $1.2 million).
- co-PI on **NSF Grant** DMS-0754486, *REU Site: Inverse Problems for Electrical Networks*, 2008–2011.
- PI on **NSF Grant** DMS-0713225, *SAGE: Software for Algebra and Geometry Experimentation*, 2007–2010.
- PI on **NSF Grant** DMS-0555776, *Explicit Approaches to the Birch and Swinnerton-Dyer Conjecture*, 2007–2010.
- co-PI on **NSF Grant** DMS-0602287, *Southwest Center for Arithmetic Geometry*, 2006–2009.
- PI on **NSF Grant,** DMS-0400386, *Explicit Approaches to Modular Forms and*

Modular Abelian Varieties, 2004–2007.
- · PI on **Sun Academic Education Grant** ($70K Sun Fire V480 server), 2003.
- · From W. R. Hearst III and Harvard ($20K for 12 Processor Cluster), 2002.
- · Clay Mathematics Institute Liftoff Fellowship, Summer 2000.
- · Berkeley Vice Chancellor Research Grant (6 Processor Cluster), 1999.

Publications   All papers are available at http://wstein.org/papers/.

44. *Databases of elliptic curves ordered by height and distributions of Selmer groups and ranks* (22 pages), with Jennifer S. Balakrishnan, Wei Ho, Nathan Kaplan, Simon Spicer and Jamie Weigandt, 2016, submitted.

43. *p-adic Heights of Heegner Points and Anticyclotomic Lambda-Adic Regulators* (34 pages), with Jennifer S. Balakrishnan and Mirela Ciperiani, 2013, Math. Comp.

42. *A p-adic analogue of the conjecture of Birch and Swinnerton-Dyer for modular abelian varieties* (33 pages), with Jennifer S. Balakrishnan and J. Steffen Müller, 2013, Math. Comp.

41. *A Database of Elliptic Curves over $\mathbf{Q}(\sqrt{5})$ – First Report* (16 pages), with Jonathan Bober, Alyson Deines, Ariah Klages-Mundt, Benjamin LeVeque, R. Andrew Ohana, Ashwath Rabindranath, Paul Sharaba, 2012, appeared in ANTS proceedings.

40. *Numerical computation of Chow-Heegner points associated to pairs of elliptic curves* (12 pages), 2012, to appear in Math. Comp. (as an appendix).

39. *Sage: Creating a Viable Free Open Source Alternative to Magma, Maple, Mathematica, and MATLAB* (9 pages), in the FoCM 2011 proceedings.

38. *Non-commutative Iwasawa theory for modular forms* (40 pages), with John Coates, Tim Dokchitser, Zhibin Liang, Ramdorai Sujatha, 2013, in Proceedings of the London Math Society.

37. *Heegner Points and the Arithmetic of Elliptic Curves over Ring Class Extensions* (20 pages), with Robert Bradshaw, April 2012, J. Number Theory.

36. *Kolyvagin's Conjecture for Some Specific Higher Rank Elliptic Curves* (40 pages), 2011, submitted.

35. *Computations About Tate-Shafarevich Groups Using Iwasawa Theory* (46 pages), with Christian Wuthrich, 2012, to apear in Mathematics of Computation.

34. *The Sage Project: Unifying Free Mathematical Software to Create a Viable Alternative to Magma, Maple, Mathematica and MATLAB* (16 pages), 2010, in the Proceedings of the International Congress of Mathematical Software, Kobe, Japan.

33. *Toward a Generalization of the Gross-Zagier Conjecture* (17 pages), 2010, Int. Math. Res. Notices.

32. *Fast Computation of Hermite Normal Forms of Random Integer Matrices* (16 pages), with Clement Pernet, Volume 130, Issue 7, July 2010, Pages 1675-1683, Journal of Number Theory.

31. *Verification of the Birch and Swinnerton-Dyer Conjecture for Specific Elliptic Curves*, with G. Grigorov, A. Jorza, S. Patrikis, and C. Patrascu (26 pages), 2009, to appear in Mathematics of Computation.

30. *The Modular Degree, Congruence Primes and Multiplicity One* (16 pages), with Amod Agashe and Ken Ribet, 2012, in a volume in honor of Serge Lang.

29. *Explicit Heegner points: Kolyvagin's conjecture and non-trivial elements in the Shafarevich-Tate group*, with Dimitar Jetchev and Kristin Lauter (18 pages), 2008, Journal of Number Theory.

28. *On the generation of the coefficient field of a newform by a single Hecke eigenvalue, with Koopa Koo and Gabor Wiese* (11 pages), 2008, J. Théor. Nombres Bordeaux.

27. *Open Source Mathematical Software (opinion piece)* (1 page), with David Joyner, Notices of the AMS, November 2007.

26. *Average Ranks of Elliptic Curve*, with Baur Bektemirov, Barry Mazur and Mark Watkins (19 pages), May 2007, Bulletins of the AMS.

25. *Visibility of Mordell-Weil Groups* (20 pages), 2008, Documenta Mathematica.

24. *Visualizing Elements of Shafarevich-Tate Groups at Higher Level*, with D. Jetchev (28 pages), 2008, Documenta Mathematica.

23. *The Manin Constant*, with A. Agashe and K. Ribet (22 pages), 2006, in the World Scientific Coates Memorial Volume.

22. *Computation of p-Adic Heights and Log Convergence*, with B. Mazur and J. Tate (36 pages), 2006, in the Documenta Mathematica Coates Memorial Volume.

21. *SAGE: System for Algebra and Geometry Experimentation* with D. Joyner, (3 pages), in the SIGSAM Bulletin, 2005.

20. *Modular Parametrizations of Neumann-Setzer Elliptic Curves*, with M. Watkins, in IMRN 2004, no. 27, 1395–1405.

19. *Studying the Birch and Swinnerton-Dyer Conjecture for Modular Abelian Varieties Using* MAGMA (23 pages), 2006, chapter in Springer-Verlag book edited by J. Cannon and W. Bosma.

18. *Conjectures about Discriminants of Hecke Algebras of Prime Level* (16 pages), with F. Calegari, in ANTS VI, Vermont, 2004.

17. *Constructing Elements in Shafarevich-Tate Groups of Modular Motives*, with N. Dummigan and M. Watkins, in "Number theory and algebraic geometry— to Peter Swinnerton-Dyer on his 75th birthday", Ed. M. Reid and A. Skorobogatov, pages 91–118.

16. *Approximation of eigenforms of infinite slope by eigenforms of finite slope*, with R. Coleman, Geometric aspects of Dwork theory. Vol. I, II, Walter de Gruyter GmbH & Co. KG, Berlin, 2004, pp. 437–449.

15. *$J_1(p)$ has connected fibers*, with B. Conrad and B. Edixhoven, Documenta Mathematica, **8** (2003), 331–408.

14. *Shafarevich-Tate Groups of Nonsquare Order*, in Progress in Math., **224** (2004), 277–289, Birkhauser.

13. *Visible Evidence for the Birch and Swinnerton-Dyer Conjecture for Rank 0 Modular Abelian Varieties* (30 pages), with A. Agashe, appeared in Mathematics of Computation.

12. *A Database of Elliptic Curves–First Report* (10 pages) with M. Watkins, in ANTS V proceedings, Sydney, Australia, 2002.

11. *Visibility of Shafarevich-Tate Groups of Abelian Varieties*, with A. Agashe, J. Number Theory, **97** (2002), no. 1, 171–185.

10. *Cuspidal Modular Symbols are Transportable*, with H. Verrill, LMS J. Comput. Math., **4** (2001), 170–181.

9. Appendix to Lario and Schoof's *Some computations with Hecke rings and deformation rings*, with A. Agashe, Experiment. Math. **11** (2002), no. 2, 303–311.

8. *There are genus one curves over* **Q** *of every odd index*, J. Reine Angew. Math. **547** (2002), 139–147.

7. *Component groups of purely toric quotients of semistable Jacobians*, with B. Conrad, Math. Res. Lett., **8** (2001), no. 5–6, 745–766.

6. *The field generated by the points of small prime order on an elliptic curve*, with L. Merel, Int. Math. Res. Notices, 2001, no. 20, 1075–1082.

5. *An introduction to computing modular forms using modular symbols* (12 pages), in MSRI Publications (Volume 44), Algorithmic Number Theory: Lattices, Number Fields, Curves and Cryptography, Cambridge University Press, 2008.

4. *A mod five approach to modularity of icosahedral Galois representations*, with K. Buzzard, Pac. J. Math., **203** (2002), no. 2, 265–282.

3. *Lectures on Serre's conjectures*, with K. A. Ribet, in Arithmetic Algebraic Geometry, IAS/Park City Math. Inst. Series, Vol. 9, 143–232.

2. *Component groups of quotients of $J_0(N)$*, with D. Kohel, Proceedings of the 4th International Symposium (ANTS-IV), 2000, 405–412.

1. *Empirical evidence for the Birch and Swinnerton-Dyer conjectures for modular Jacobians of genus 2 curves*, with E. V. Flynn, F. Leprévost, E. F. Schaefer, M. Stoll, J. L. Wetherell, Math. of Comp. **70** (2001), no. 236, 1675–1697.

Books

5. *Prime Numbers and the Riemann Hypothesis* (154 pages), with B. Mazur (see http://wstein.org/rh/); published by Cambridge University Press.

4. *Algebraic Number Theory, a Computational Approach* (215 pages), (see http://wstein.org/books/ant/); under contract with the AMS.

3. *Modular Forms, a Computational Approach*, (268 pages), published as AMS Graduate Studies in Mathematics, Volume **79**, 2007, and available at http://wstein.org/books/modform/.

2. *Elementary Number Theory* (185 pages), published in the Springer-Verlag UTM series, 2008, http://wstein.org/ent/.

1. *Lectures on Modular Forms and Galois Representations* (200 pages), with K. A. Ribet (on hold).

Computation

· Founder/CEO of SageMath, Inc. (a company)

· Founder of SageMathCloud (https://cloud.sagemath.com).

· Founder of the SageMath (http://www.sagemath.org) open source mathematical software project.

· Fluent in Python, Cython, Javascript, C/C++ and Magma.

· Modular forms, modular symbols, and modular abelian varieties components of Magma (over 25,000 lines of code).

Selected Teaching

University of Washington
· *Math 581f: Topics in Computational Number Theory*, Fall 2013.
· *Math 480a/582: Sage – Free Open Source Math. Software*, Spring 2013.
· *Math 308: Linear Algebra*, Spring 2013.
· *Math 581e: Algebraic Number Theory*, Fall 2012.
· *Math 480a/582: Sage – Free Open Source Math. Software*, Winter 2012.
· *Math 581g: Lectures on Modular Forms and Hecke Operators*, Fall 2011.
· *Math 480a: Sage – Free Open Source Mathematical Software*, Spring 2011.
· *Math 581b: Algebraic number theory graduate course*, Fall 2010.
· *Math 581d: Computer Programming for Mathematicians*, Fall 2010.
· *Math 480: Computer Programming for Mathematicians*, Spring 2010.
· *Math 582e: Galois Cohomomogy*, Winter 2010.
· *Math 414: Elementary Number Theory*, Winter 2010.
· *Math 583e: Graduate Computational Number Theory, part 2*, Spring 2009.
· *Math 480: Open Source Mathematical Software*, Spring 2009.
· *Math 582e: Graduate Computational Number Theory*, Winter 2009.
· *SIMUW: Mathematical Finance*, Summer 2008.
· *Math 480: Open Source Mathematical Software*, Spring 2008.
· *Math 581f: Graduate Algebraic Number Theory*, Fall 2007.
· *SIMUW: The Riemann Hypothesis*, Summer 2007.
· *Math 583: The Birch and Swinnerton-Dyer Conjecture*, Spring 2007.
· *Math 480: Elementary Number Theory*, Spring 2007.
· *SIMUW: The Congruent Number Problem*, Summer 2006.
· *Math 583: Computing with Modular Forms*, Spring 2006.

UC San Diego
· *Elliptic Curves and Modular Forms*, Fall 2005.
· *Calculus For Scientists and Engineers*, Winter 2006.

Harvard University
· *Freshman Seminar on Fermat's Last Theorem*, Fall 2004.
· *Computing With Modular Forms*, Fall 2004.
· *Algebraic Number Theory*, Spring 2004.
· *Modular Abelian Varieties*, Fall 2003.
· *Freshman Seminar on Elliptic Curves*, Spring 2003.
· *Elementary Number Theory*, Fall 2001 and Fall 2002.
· *Linear Algebra*, Fall 2001 and Spring 2002.
· Advised 6 senior honors theses.
· Directed 8 funded undergraduate research projects.
· Participated in first *Clay Mathematics Research Academy*, 2001.
· Seminar Organization:
    – *The Basic Notions Seminar*, 2003–present.
    – *The Modular Curves Seminar*, 2000–present.
    – *Harvard Colloquium*, 2001–2002.

IAS/Park City Mathematics Institute
- *Teaching Assistant*, Summer 1999, K. Ribet's course on Serre's conjectures.

University of California at Berkeley
- *Curriculum Development*, 1997–1998, wrote instructional software.
- *Discrete Mathematics*, Summer 1997.
- *Calculus*, Fall 1995–Spring 1997, teaching assistant.

Northern Arizona University
- *College Mathematics With Applications*, Spring 1995.
- *College Algebra*, Fall 1994.

Ph.D. Students

- **Andrew Ohana**, Ph.D. expected June 2017 on *ABC Conjecture data.*
- **Hao Chen**, Ph.D. expected June 2016 on *Modular points on elliptic curves.* Microsoft Research.
- **Simon Spicer**, Ph.D. received June 2015 on *The. Explicit Formula.* Now at Facebook.
- **Alyson Deines**, Ph.D. received June 2014 on *Discriminant Twins.* Now at CCR.
- **Robert Bradshaw**, Ph.D. received June 2010 on *Provable Computation of Motivic L-function.* Now at Google.
- **Robert Miller**, Ph.D. received June 2010 on *Verification of the Birch and Swinnerton-Dyer conjecture for individual elliptic curves.* Now at Google.

Seminars

For a list of invited talks, see http://wiki.wstein.org/schedule.

Other Activities

Workshop and Conference Organization: I (co-)organized all of the following workshops and conferences.

54. *Sage Days 70*, Nov 8-14, 2015, Berkeley.
53. *Sage Days 68: Bug Days*, August 21-27, 2015.
52. *Sage Days 61: Quaternion Orders and Brandt Modules*, August 25-29, 2014, Copenhagen, Denmark.
51. *Sage Days 48: Notebook Dev*, June 17-21, 2013, at UW.
50. *Sage Days 46: Computational number theory*, February 26-March 2, 2013, Hawaii.
49. *Reproducibility in Computational and Experimental Mathematics*, at ICERM (Brown University), Dec 10-14, 2012.
48. *SIMUW: Deep Conjectures in Number Theory*, Summer 2012.
47. *AMS Arithmetic Statistics School*, June 24-30, 2012, in Snowbird Utah.
46. *Sage Days 41: The Sage Notebook*, June 11-15, 2012, at UW.
45. *Sage Days 40.5: Bug Days*, May 24–29, 2012 in Gold Bar, WA.
44. *Sage Days 36.5: Overconvergent Modular Symbols*, April 17-22, 2012, at UW.
43. *Sage Days 36: p-adics in Sage*, Feb 2012, San Diego, CA.

42. *AMS Short Course: Computing with Elliptic Curves using Sage* at the Joint Math Meetings in 2012 in Boston.

41. *Sage Days 32: Bug Days*, at UW.

40. *REU: Elliptic Curves*, 8 weeks of summer 2011, at UW.

39. *Sage Days 31: The Sage Notebook*, June 2011, UW.

38. *Sage Days 29*, March 2011, UW.

37. *MSRI Program in Arithmetic Statistics*, Spring 2011, at MSRI in Berkeley.

36. *Sage Days 27: Bug Days*, January 2011, UW.

35. *Sage Days 26: Women in Sage*, December 2010, UW.

34. *Workshop on Elliptic Curves and Computation*, October 2010, Microsoft Research.

33. *Sage Days 25: Numerical computation*, August, 2010, in Mubmai, India.

32. *Sage Days 24: Symbolic computation*, July, 2010 at RISC in Linz, Austria.

31. *Sage Days 23: Number theory*, July, 2010 in Leiden, Netherlands.

30. *Sage Days 22: MSRI Summer Graduate Student Workshop on Elliptic Curves*, June 2010 in MSRI (Berkeley, CA).

29. *Sage Days 21: Function fields*, May 2010, UW.

28. *Sage Days 19: Bug Smash*, January 2010, UW.

27. *Sage Days 18: Computations related to the Birch and Swinnerton-Dyer Conjecture*, Dec 2009, at the Clay Mathematics Institute in Cambridge, MA.

26. *Sage Days 17: Computing with Modular forms and L-functions*, Sep. 2009, on Lopez Island.

25. *Sage Days 16: Computational Number Theory*, June 2009, in Barcelona, Spain.

24. *Sage Days 15*, May 2009.

23. *Arizona Winter School: Quadratic Forms*, March 2009.

22. *Sage Days 14: Sage and Macaulay2 for Algebraic Geometry Experimentation*, March 2009, MSRI (Berkeley).

21. *Sage Days 13: Quadratic Forms and Lattices*, March 2009, Athens, Georgia.

20. *Sage Days 12: Bug Smash*, Jan. 2009, San Diego, CA.

19. *Sage Days 11: Special functions and computational number theory meet scientific computing*, Nov. 2008, Austin, Texas.

18. *Sage Days 9: Mathematical graphics and visualization*, Aug. 2009, Vancouver.

17. *Workshop on L-functions and Modular Forms*, June 2008, UW.

16. *L-functions Summer School and Coding Sprint*, June 2008, UW.

15. *Sage Developer Coding Days*, June 2008, UW.

14. *Arizona Winter School: Special Functions and Transcendence* , March 2008, Univ. of Arizona.

13. *Sage Days 8: Number Theory and High Performance Numerical Computation*, March 2008, at UT Austin.

12. *Sage Days 7,* Feb 2008, IPAM (UCLA).

11. *SAGE Days 6,* Nov. 2007, Bristol, UK.

10. *SAGE Days 5 – Computational Arithmetic Geometry,* Oct 2007 at the Clay Math Institute in Cambridge, MA.

9. *Workshop on Modular Forms and L-functions,* Aug. 2007 at AIM (Palo Alto).

8. *Sage Days 4,* June 2007 at UW.

7. *Modular Forms: Arithmetic and Computation,* June 2007 at Banff.

6. *Arizona Winter School: p-adic Geometry,* March 2007 at Univ. of Arizona.

5. *Sage Days 3,* Feb. 2007 at IPAM (UCLA).

4. *Interactive Parallel Computation in Support of Research in Algebra, Geometry and Number Theory,* Feb 2007 at MSRI (Berkeley).

3. *Sage Days 2,* Oct. 2006 at UW.

2. *Summer Graduate Workshop on Computing with Modular Forms,* July 2006 at MSRI (Berkeley).

1. *Sage Days 1,* Feb 2006 at UC San Diego.

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