

Mark E. Walker

January 15, 2012

Education:

B.S (Mathematics, with Honors)	1990	New Mexico State University
M.S. (Mathematics)	1992	University of Illinois
Ph.D. (Mathematics)	1996	University of Illinois

Professional Experience:

Visiting Assistant Professor	1996 – 1998	University of Nebraska–Lincoln
Visiting Scholar	Jan. – Mar. 1997	Northwestern University
Visiting Scholar	Sep. – Dec. 1997	Northwestern University
Visiting Scholar	Jan. – April 1999	Rutgers University
Assistant Professor	1998 – Aug. 2002	University of Nebraska–Lincoln
Graduate Faculty Fellow	since Dec. 1999	
Associate Professor	Aug. 2002 – Aug. 2006	University of Nebraska–Lincoln
Professor	Aug. 2006 – present	University of Nebraska–Lincoln

Research Interests:

Algebraic K -theory, motivic cohomology, algebraic geometry, commutative algebra

Memberships in Professional Societies:

AMS

Current Ph.D. students:

- Xuan Yu
- Jason Hardin

Former Ph.D. students:

- Olgur Celikbas (jointly supervised with Roger Wiegand)
- Mu-wan Huang
- Xuyen (Suanne) Au

Funded Grants:

1. NSF Postdoctoral Fellowship, “Algebraic K -theory and Motivic Cohomology”, August 1996 – August 1999; \$66,000.
2. NSF Grant, “Topics in Commutative Algebra and Algebraic Geometry”, (I was one of six faculty on this grant), June 1997 – May 2000; \$30,030.
3. NSA Grant, “Algebraic K -theory and Motivic Cohomology”, January 2000 – December 2001; \$26,000.
4. NSF Grant, “Topics in Commutative Algebra and Algebraic Geometry”, (I was one of six faculty on this grant), July 2000 – June 2004; \$45,936.
5. NSA Grant, “Semi-topological K -theory”, January 2002 – December 2003, \$26,000.
6. DoE GAANN Grant. August 2003 – August 2006. \$595,008. I was a co-PI on this grant, but Roger Wiegand was the lead PI and Judy Walker did the vast majority of the writing of this proposal.
7. NSA Grant, “ K -theory, Lawson Homology, and Hodge Theory”, January 2005 – December 2006, \$26,000. Note: Due to a clerical error by the NSA, this grant was kept active until December 2007.
8. DoE GAANN Grant, August 2006 – August 2009, \$498,000. I am a co-PI on this grant proposal, but Roger Wiegand is the lead PI and he did virtually all of the writing of it.
9. NSF Grant, “Algebraic cycles, motives, and K -theory”, July 2006 – June 2010, \$164,173.
10. NSF, “FRG: Collaborative Research: Homotopical Methods in Algebraic Geometry” (with Aravind Asok, Eric Friedlander and Christian Haesemeyer), June 2010 – May 2013. The total grant is about \$1.5 million and UNL’s portion is \$175,933.

Publications:

- [1] *How Hamiltonian can a finite group be?* (with Gary J. Sherman and Thomas J. Tucker) **Archiv der Mathematik**, **57** (1991), 1-5.
- [2] *Rewriteability in finite groups*; (with Gary J. Sherman and Judy L. Leavitt) **American Mathematical Monthly**, **99** (1992) No. 5, 446-452.
- [3] *The primitive topology of a scheme*; **Journal of Algebra**, **201** (1998), 656–685.
- [4] *Adams operations for bivariant K -theory and a filtration using projective lines*; **K-theory**, **21**, No. 2 (2000), 101–140.
- [5] *Weight zero motivic cohomology and the general linear group of a simplicial ring*; **Journal of Pure and Applied Algebra**, **147** (2000), 311–319.

- [6] *Weight one motivic cohomology and K-theory*; **American Journal of Mathematics**, **123** (2001), 1–35.
- [7] *Function spaces and continuous algebraic pairings for varieties* (with Eric Friedlander); **Compositio Mathematica**, **125** (2001), 69–110.
- [8] *Geometric models for algebraic K-theory* (with Dan Grayson); **K-theory**, **20**, No. 4 (2000), 311–330.
- [9] *Semi-topological K-theory using function complexes* (with Eric Friedlander); **Topology**; **41**, Issue 3 (2002) 591–644.
- [10] *Comparing K-theories for complex varieties* (with Eric Friedlander); **American Journal of Mathematics**, **123** (2001), 779–810.
- [11] *Some remarks concerning mod- n K-theory* (with Eric Friedlander); **Inventiones Mathematicae**, **145** (2001), 545–555.
- [12] *Semi-topological K-theory of real varieties* (with Eric Friedlander); **Proceedings of the International Colloquium on Algebra, Arithmetic and Geometry, Mumbai 2000, Part I** (2002); pp. 219–326.
- [13] *Semi-topological K-homology and Thomason’s theorem*; **K-theory**, **26** (2002), 207–286.
- [14] *Rational isomorphisms between K-theories and cohomology theories*; (with Eric Friedlander); **Inventiones Mathematicae**, **154** (2003) 1–61.
- [15] *Thomason’s Theorem for varieties over algebraically closed fields*; **Trans. Amer. Math. Soc.**, **356** (2004) 2569–2648 (electronic).
- [16] *Techniques, computations, and conjectures for semi-topological K-theory* (with Eric Friedlander and Christian Haesemeyer); **Math. Ann.**, **330** (2004) 759–807.
- [17] *Semi-topological K-theory* (with Eric Friedlander), pp. 877–924 in **Handbook of K-theory** (2005), E. M. Friedlander and D. R. Grayson editors. This is a chapter in a refereed collection on topics pertaining to K -theory and motivic cohomology.
- [18] *Homology of linear groups via cycles in $BG \times X$* (with Kevin Knudson); **The Journal of Pure and Applied Algebra**, **192** (2004), 187–202.
- [19] *Chern classes for twisted K-theory*; **The Journal of Pure and Applied Algebra**, **206** (2006), 153–188.
- [20] *The morphic Abel-Jacobi map*; **Compositio Mathematica**, **143** (2007), 909–944.
- [21] *Sir Michael Atiyah’s Einstein lecture: “The nature of space”* (with G. W. Johnson); **Notices Amer. Math. Soc.**, **53** (2006), 674–678.
- [22] *A new proof of the New Intersection Theorem* (with G. Piepmeyer); **Journal of Algebra**, **322** (2009), 3366–3372.

- [23] *The K-theory of toric varieties* (with G. Cortiñas, C. Haesemeyer, and C. Weibel); **Trans. Amer. Math. Soc.**, **361** (2009), 3325–3341.
- [24] *Bass’ NK groups and cdh-fibrant Hochschild homology* (with G. Cortiñas, C. Haesemeyer, and C. Weibel); **Inventiones Mathematica**, **181** (2010), 421–448. (Accepted in 2010.)
- [25] *The equivariant K-theory of toric varieties* (with Suanne Au and Mu-wan Huang); **The Journal of Pure and Applied Algebra**, **213** (2009), 840–845.
- [26] *Hochster’s Theta invariant and the Hodge-Riemann bilinear relations* (with Frank Moore, Greg Piepmeyer and Sandra Spiroff); **Advances in Mathematics**, **226** (2011) 1692–1714.
- [27] *K-theory of cones of smooth varieties* (with G. Cortiñas, C. Haesemeyer, and C. Weibel), **Journal of Algebraic Geometry**, approximately 18 pages. In press, accepted for publication in February, 2011.
- [28] *A negative answer to a question of Bass* (with G. Cortiñas, C. Haesemeyer, and C. Weibel), **Proceedings of the AMS**, **139** (2011), 1187–1200.
- [29] *Hochster’s theta pairing and algebraic equivalence* (with Olgur Celikbas), approximately 12 pages. Accepted for publication to **Math. Annalen** on May 20, 2011.
- [30] *Toric Varieties, monoid schemes and cdh descent* (with G. Cortiñas, C. Haesemeyer, and C. Weibel), submitted for publication in May 2011.
- [31] *On an invariant of graded isolated complete intersection singularities* (with Frank Moore, Greg Piepmeyer and Sandra Spiroff), submitted for publication in October 2011.
- [32] *Matrix factorizations over projective schemes* (with Jesse Burke), submitted for publication in November 2011.

Talks:

Talks Presented at Conferences:

- “The weight one motivic complex arising from the K -theory of automorphisms”; Workshop on Algebraic K -theory and Arithmetic held at the Fields Institute for Research in Mathematical Sciences, Waterloo, Ontario; March 1994.
- “Motivic complexes and the K -theory of automorphisms”; Algebraic K -theory and Homotopy Theory conference, Oberwolfach, Germany; November 1995.
- “Adams operations on a weight filtration of K -theory”; Special Session on K -theory at the American Mathematical Society Eastern Sectional Meeting, Lawrenceville, New Jersey; October 1996.
- “A filtration of K -theory and rational motivic complexes”; 3rd Annual Great Lakes K -Theory Conference, Evanston, Illinois; April 1997.

- “ K -theory and weight one motivic cohomology”; Joint Summer Research Conference on Algebraic K -theory, Seattle, Washington; July 1997.
- “The primitive topology”; Special Session on K -theory and Motives at the American Mathematical Society Central Sectional Meeting, Milwaukee, Wisconsin; October 1997.
- “Interpolating algebraic and topological K -theory”; First Annual MUNUKU conference, University of Kansas, Lawrence, Kansas; September 1999.
- “Semi-topological K -theory”; Algebraic K -theory conference, Oberwolfach, Germany; September 1999.
- “Semi-topological K -theory and K -homology”; Sixth Annual Great Lakes K -Theory Conference, Toronto, Canada; March 2000.
- “Semi-topological and topological K -theory”; Special Session on Algebraic Geometry at the Fifth Joint AMS-SMM Meeting, Morelia, Mexico; May 2001.
- “Interpolating algebraic and topological K -theory”; Northwestern University Algebraic Topology Conference; Plenary Speaker; March 2002.
- “Semi-topological theories and weight filtrations”; Midwest Topology Conference in Urbana, Illinois; Plenary Speaker; April 2003.
- “On semi-topological K -theory and Lawson homology”; Conference on The Arithmetic, Geometry and Topology on Algebraic Cycles in Morelia, Mexico; Plenary Speaker; July 2003
- “The twisted total Chern class map”; Eric Friedlander’s 60th Birthday Conference in Evanston, Illinois; Invited Speaker; September 2004.
- “The morphic Abel-Jacobi map”; Algebraic K -theory Conference in Montreal, Canada; October 2004.
- “The morphic Abel-Jacobi map”; Topology Workshop, SUNY-Buffalo; September 2005.
- “The morphic Abel-Jacobi map”; Motives and Periods Conference, Vancouver, Canada; June 2006.
- “The morphic Abel-Jacobi map”; UNL Department of Mathematics Colluquium, August 2006.
- “The K -theory of toric varieties”; Workshop on the Homotopy Theory of Schemes; Fields Institute; March 2007.
- “Equivariant K -theory of toric varieties”; Conference on Algebraic Cycles; Columbus, Ohio; March 2008.
- “On a question of Bass”; AMS Special Session on Algebraic K -theory and Nil groups in Algebra and Topology; Bloomington, Indiana; April 2008.
- “Algebraic K -theory of toric varieties in characteristic p ”; Algebraic K -theory and Motivic Cohomology Conference, Oberwolfach, Germany; June 2009.

- “Introduction to Lawson Homology, I and II”; International Workshop on Motives, Tokyo, Japan; December 2010.
- “On the singularity category of a complete intersection”; K-theory and Motives Conference in honor of Andrei Suslin’s 60-th Birthday; March 2011.

Seminar Talks at Other Institutions:

- “A filtration of K-Theory using projective lines”; Algebra Seminar, Northwestern University; January 1997.
- “ K -theory and the primitive topology”; Algebra Seminar, Northwestern University; October 1997.
- “A weight filtration of algebraic K -theory”; Topology Seminar, University of Chicago; October 1997.
- “Is there an Atiyah-Hirzebruch Spectral Sequence?”; Motivic Cohomology Seminar, University of Illinois; November, 1997.
- No official title; Motivic Cohomology Seminar, University of Illinois; July, 1998.
- “On the total Chern class map”; Algebra Seminar, Rutgers University; February 1999.
- “Semi-topological K -theory of real varieties”; Algebra Seminar, Northwestern University; October 2000.
- “Semi-topological K -theory”; Algebra Seminar, Wayne State University in Detroit, Michigan; November 2000.
- “Hochster’s θ invariant and the Hodge Index Theorem”, Algebra Seminar, University of Southern California, October 2008.
- “What is the K -theory of a monoid?”, Topology Seminar, MIT, December 2010.

Colloquia:

- “The morphic Abel-Jacobi map”; UNL; August 2006.
- “The K -theory of toric varieties”, University of California at Los Angeles, October 2008.

Teaching and Mentoring:

Teaching and Advising Honors:

- College of Arts and Sciences Distinguished Teaching Award; Spring 2003.
- UNL Parents Association and the Teaching Council; 2000 and 2004.
Certificate of Recognition for Contributions to Students

- Roger Wiegand Faculty Award; 2004. This award is presented by the graduate students of the department to one faculty member each year. (The year 2004 was the first year the award was given.)

Mentoring:

1. Served as research mentor for Sandra Spiroff in the summer of 2007 as part of the departments IMMERSE program. Sandy also visited in the summer of 2008 with an AWM travel grant, and I was her official mentor for that too.
2. Post-doctoral mentor of Greg Piepmeyer.
3. Teaching Mentor for Susan Cooper, 2008–2009.
4. Teaching Mentor for Ines Henriques, 2009–2010.
5. Teaching Mentor for Carina Curto, 2009–present.

Other Educational Activities:

1. Directed two-year-long undergraduate research project of Gerard Gjonej as part UNL's UCARE program, from Fall 2000 through Spring 2002.
2. *Project NExT* Fellow. Project NExT is an organization for recent Ph.D. recipients in mathematics which facilitates the communication of teaching innovations and ideas.

Recent Service Activities:

Departmental Service:

1. Reviewed graduate school applications in January 2011 (as something like an ad hoc member of the GAC).
2. Member of Teaching Advisory Committee; Fall 2008–present.
3. Member of Department Executive Committee; Fall 2006–Spring 2008.
4. Graduate Recruiting Chair; Fall 2001–Spring 2004 and Fall 2005–Spring 2008.
5. Member of Graduate Advisory Committee; Fall 2001–Spring 2004 and Fall 2005–Spring 2008.
6. Helped organize True/False Math Mayhem Challenge; Fall 2000, Spring 2002, and March 2004. These were popular and successful mathematics competitions in which about 20 UNL undergraduate students participated.
7. Co-organizer of the Putnam Competition team for UNL; 1998–2004.

University Service:

- Serving on UNL Graduate Council, Fall 2007–present.
- Reviewer for Dean’s Award for Excellence in Graduate Education, 2009.
- Served on UNL Research Council, Fall 2006–Spring 2009. Served as Chair of this committee, Fall 2008–Spring 2009.
- Panelist for the review of the EPSCOR applications, November 2008.
- Reviewer for 2008 Outstanding Graduate Research Assistant. (Work done in 2007.)
- Served on UNL Graduate Council, 2002–2003 academic year.

Conference Organization:

1. Co-organizer of an American Mathematical Society, Central Section, Special Session on *K-theory and Motivic Cohomology*, at DePaul University, Chicago, Illinois; September, 1998.
2. Co-organizer of an American Mathematical Society, Central Section, Special Session on *K-theory and Algebraic Cycles*, at University of Nebraska–Lincoln; October, 2005.
3. Co-organizer (with Avramov and Iyengar) conference *Homotopy Theory and Its Applications* at University of Nebraska–Lincoln; April 2009. This was companion conference to the 2009 Rowlee Lecture delivered by Michael Hopkins, which I also organized.