

# Daniel K. Dugger

## *Curriculum Vita*

### WORK ADDRESS

Department of Mathematics  
University of Oregon  
Eugene, OR 97403

### PHONE/COMPUTER

Work: (541) 346-0990  
email: [ddugger@uoregon.edu](mailto:ddugger@uoregon.edu)  
web: [pages.uoregon.edu/ddugger](http://pages.uoregon.edu/ddugger)

RESEARCH INTERESTS: Algebraic topology,  $K$ -theory, commutative algebra.

### EMPLOYMENT

**University of Oregon** — September 2002 to present.

Professor: September 2015–present

Department Head: July 2017–present.

Associate Head: July 2014–July 2017.

Director of Undergraduate Studies: September 2013–July 2017.

Associate Professor: September 2007–August 2015.

Assistant Professor: September 2004–June 2007.

Paul Olum Visiting Assistant Professor: September 2002–June 2004.

**Purdue University** — Research Assistant Professor, August 1999 to May 2002.

### EDUCATION

**Massachusetts Institute of Technology** — September 1994 to May 1999.

PhD in Mathematics, May 1999.

Thesis title: A Postnikov Tower for Algebraic  $K$ -theory.

Thesis supervisor: Michael J. Hopkins.

**University of Michigan** — September 1990 to August 1994.

B.A. in Mathematics, August 1994.

### GRANTS

Simons Collaboration Grant, start-date September 1, 2019.

Title: Equivariant homotopy theory for spaces with involution.

Five-year grant, \$42,000.

National Science Foundation Grant No. DMS-0905888, awarded August 15, 2009.

Three-year renewable grant, \$200,441.

National Science Foundation Grant No. DMS-0604354, awarded July 1, 2006.

Three-year renewable grant, \$90,057 total.

### PUBLICATIONS

[33] *Stable categories and spectra via model categories*, to appear in the volume *Stable categories and structured ring spectra*, edited by A. Blumberg, T. Gerhardt, and M. Hill [expository paper]. 77 pages.

[32] *Involutions on surfaces*, *J. Homotopy Relat. Struct.* **14** (2019), no. 4, 919–992.

[31]  *$Z/2$ -equivariant and  $R$ -motivic stable stems*, joint with D. C. Isaksen, *Proc. Amer. Math. Soc.* **145** (2017), no. 8, 3617–3627.

- [30] *Low-dimensional Milnor-Witt stems over  $R$* , joint with D. C. Isaksen, *Annals of K-theory* 2–2 (2017), 175–210.
- [29] *Bigraded cohomology of  $Z/2$ -equivariant Grassmannians*, *Geometry and Topology* **19** (2015), no. 1, 113–170.
- [28] *Grothendieck groups of complexes with null-homotopies*, *J. K-theory* **13** (2014), no. 3, 517–531.
- [27] *The 1913 paper of René Gâteaux, upon which the modern-day influence function is based*, joint with P. Lambert, *Journal of Economic Inequality* **12** (2014), 149–152. [Historical paper]
- [26] *Coherence for invertible objects and multi-graded homotopy rings*, *Alg. Geom. Top.* **14** (2014), 1055–1106.
- [25] *Motivic Hopf elements and relations*, joint with D.C. Isaksen, *New York J. Math.* **19** (2013), 823–871.
- [24] *Mapping spaces in quasi-categories*, joint with D. I. Spivak, *Alg. Geom. Top.* **11** (2011), 263–325.
- [23] *Rigidification of quasi-categories*, joint with D. I. Spivak, *Alg. Geom. Top.* **11** (2011), 225–261.
- [22] *The motivic Adams spectral sequence*, joint with D. Isaksen, *Geom. Topol.* **14** (2010), no. 2, 967–1014.
- [21] *A curious example of triangulated-equivalent model categories which are not Quillen equivalent*, joint with B. Shipley. *Algebr. Geom. Topol.* **9** (2009), no. 1, 135–166.
- [20] *Eigentheory of Cayley-Dickson algebras*, joint with D. Biss, J. D. Christensen, and D. Isaksen. *Forum Math.* **21** (2009), no. 5, 833–851.
- [19] *Étale homotopy and sums-of-squares formulas*, joint with D. Isaksen. *Math. Proc. Cambridge Philos. Soc.* **145** (2008), 1–25.
- [18] *Large annihilators in Cayley-Dickson algebras*, joint with D. Biss and D. Isaksen. *Comm. Algebra* **36** (2008), no. 2, 632–664.
- [17] *Large annihilators in Cayley-Dickson algebras II*, joint with D. Biss, J. D. Christensen, and D. Isaksen. *Bol. Soc. Mat. Mexican (3)* **13** (2007), no. 2, 269–292.
- [16] *Enriched model categories and an application to additive endomorphism spectra* with B. Shipley. *Theory and Appl. of Categories* **18** (2007), 400–439.
- [15] *Topological equivalences for differential graded algebras*, joint with B. Shipley. *Advances in Math.* **212**, no. 1 (2007), 37–61.
- [14] *The Hopf condition for bilinear forms over an arbitrary field*, joint with D. Isaksen. *Annals Math* **165**, no. 3 (2007), 943–964.
- [13] *Postnikov extensions of ring spectra*, joint with B. Shipley, *Alg. Geom. Topol.* **6** (2006), 1785–1829.
- [12] *Spectral enrichments of model categories*, *Homology Homotopy Appl.* **8** (2006), no. 1, 1–30.
- [11] *Algebraic K-theory and sums-of-squares formulas*, joint with D. Isaksen, *Documenta Math.* **10** (2005), 357–366.
- [10] *Motivic cell structures*, joint with D. Isaksen, *Algebr. Geom. Topol.* **5** (2005), 615–652.
- [9] *An Atiyah-Hirzebruch spectral sequence for KR-theory*, *K-theory* **35** (2005), 213–256.
- [8] *K-theory and derived equivalences*, joint with B. Shipley, *Duke Math. J.* **124** (2004), no. 3, 587–617.
- [7] *Hypercovers and simplicial presheaves*, joint with S. Hollander and D. Isaksen, *Math. Proc. Cambridge Philos. Soc.* **136** (2004), no. 1, 9–51

- [6] *Topological hypercovers and  $A^1$ -realizations*, joint with D. Isaksen, *Math. Zeit.* **246** (2004), no. 4, 667–689.
- [5] *Weak equivalences of simplicial presheaves*, joint with D. Isaksen. *Homotopy theory: relations with algebraic geometry, group cohomology, and algebraic  $K$ -theory*, 97–113, *Contemp. Math.*, 346, Amer. Math. Soc., Providence, RI, 2004.
- [4] *Combinatorial model categories have presentations*, *Adv. Math.* **164** (2001), 177–201.
- [3] *Universal homotopy theories*, *Adv. Math.* **164** (2001), 144–176.
- [2] *Replacing model categories by simplicial ones*, *Trans. Amer. Math. Soc.*, vol. **353** (2001), no. 12, 5003–5027.
- [1] *Betti numbers of almost complete intersections*, *Illinois. J. Math.* **44** (2000), no. 3, 531–541.

#### PREPRINTS

- [A] *Equivariant  $\underline{Z}/\ell$ -modules for the cyclic group  $C_2$* , joint with C. Hazel and C. May, 2020. 37 pages.
- [B] *Involutions in the topologists' orthogonal group*, 2016. 20 pages. Submitted.
- [C] *Gysin functors and the Grothendieck-Witt category, Part 1*, 2016. 45 pages. Submitted.
- [D] *Classification spaces of maps in model categories*, 2006. 10 pages. arXiv:math/0604537.  
(Preprints available at <http://math.uoregon.edu/~ddugger>).

#### BOOKS IN PROGRESS (drafts available at <http://math.uoregon.edu/~ddugger>)

- A geometric introduction to  $K$ -theory. 293 pages as of November 2019.
- Notes on homotopy theory. 232 pages as of September 2020.
- Navigating the motivic world. 216 pages (on hold).
- Quantum theory for topologists. 231 pages (on hold).
- A primer on homotopy colimits. 109 pages (last updated January 2017).

#### EXPOSITORY PAPERS

- Notes on the Milnor conjectures*, 2004. 30 pages. arXiv:math/0408436.
- Multiplicative structures on homotopy spectral sequences I, II*, 2003. 49 pages. arXiv:math/0505173 and math/0505187.
- Notes on Delta-Generated spaces*, 2003. 4 pages.
- The Zariski and Nisnevich decent theorems*, 2001. 7 pages.
- The Polar form of the gradient*, 1999. 7 pages.

#### TEACHING EXPERIENCE

##### **PhD Students:**

- William Kronholm, PhD completed in Spring 2008.
- Jennifer Burman, PhD completed in Spring 2010.
- Patrick Schultz, PhD completed in Spring 2014.
- Erig Hogle, PhD completed in Spring 2018.
- Clover May, PhD completed in Spring 2018.
- Dan Raies, PhD completed in Spring 2019.
- Cindy Lester, PhD completed in Spring 2019.
- Christy Hazel, PhD completed in Spring 2020.

Ross Casebolt, 2019–present.  
Kelly Pohland, 2019–present.  
Diego Manco Berrio, 2020–present.  
Bo Phillips, 2020–present.

**Other Students:**

Greta Swanson, undergraduate Honors thesis, 2005–06. “Exploring the dynamics of the Julia set.”  
Donald Acker, undergraduate Honors thesis, 2007–08. “Universal covers of compact, connected 2-manifolds.”  
Trieste Desautels, undergraduate summer research project, 2017–18.  
Montana Jannsens, undergraduate summer research project, 2018–19.

**Undergraduate Reading courses at University of Oregon:**

History and applications of calculus, Fall 2016 (one student).  
Advanced topics in real analysis, Fall 2015 (one student).

**Regular courses taught at University of Oregon:**

Formal Group Laws and Stable Homotopy Groups of Spheres (MA692)–spring 2020.  
Introduction to Statistics (MA243)–fall 2019.  
Mathematical Cryptography (MA458)–spring 2019.  
Combinatorics MathLab (MA206)–fall 2018.  
Foundations MathLab (MA205)–fall 2018.  
K-theory (MA691)–winter 2018.  
Combinatorics MathLab (MA206)–fall 2017.  
Foundations MathLab (MA205)–fall 2017.  
Topics in Topology and Geometry (MA692)–spring 2017.  
History and Applications of Calculus (MA410)–spring 2017.  
Introduction to Proof (MA307)–fall 2016.  
Calculus III (MA253)–winter 2016.  
Calculus II (MA 251)–fall 2015.  
The Weil Conjectures (MA607)–fall 2015.  
Geometry from an Advanced Viewpoint I, II (MA394–395)–fall 2014, winter 2015.  
Calculus I (MA251)–fall 2015.  
Business Calculus II (MA242)—spring 2014.  
Introduction to algebraic topology I, II, III (MA634–636)—fall 2013, winter 2014, spring 2014.  
Business Calculus II (MA242)—spring 2012.  
Differential Equations (MA256)—winter 2012.  
Introduction to  $K$ -theory (MA691)—winter 2012.  
Introduction to Mathematical Cryptography (MA410)—fall 2011.  
Business Calculus II (MA242)—spring 2011.  
Quantum Field Theory and Topology (MA607)—winter 2010.  
Calculus for Biological Sciences I, II (MA246–247)—fall 2010, winter 2010.

Graduate algebraic topology (MA634–636)—fall 2009, winter 2010, spring 2010.  
 Introduction to Proofs (MA307)—spring 2009.  
 Morse Theory (MA691)—winter 2008.  
 Multivariable Calculus II (MA282)—winter 2008.  
 Multivariable Calculus I (MA281)—fall 2008.  
 Topics in algebraic topology (MA692)—winter 2008.  
 Discrete dynamical systems (MA457)—spring 2008.  
 $K$ -theory (MA691)—winter 2008.  
 Linear Algebra II (MA342)—winter 2008.  
 Linear Algebra I (MA341)—fall 2007.  
 Introduction to differential equations (MA256)—spring 2007.  
 Probability and Statistics for Business (MA243)—spring 2007.  
 Undergraduate topology (MA431-432)—fall 2006, winter 2007.  
 Business Calculus I (MA241)—fall 2007.  
 Graduate Algebraic Topology (MA634–636)—fall 2005, winter 2006, spring 2006.  
 Calculus I (MA251)—fall 2005.  
 Discrete Dynamical Systems (MA457)—spring 2005.  
 Business calculus II (MA242)—spring 2005.  
 Multivariable calculus II (MA282)—spring 2005.  
 Multivariable calculus I (MA281)—winter 2005.  
 Dynamical Systems (MA457)—spring 2004.  
 Linear Algebra II (MA342)—spring 2004.  
 Linear Algebra I (MA341)—winter 2004.  
 Homological Algebra (MA681)—fall 2003.  
 Multivariable calculus II (MA282)—spring 2003.  
 Multivariable calculus I (MA281)—winter 2003.  
 Linear algebra II (MA342)—winter 2003.  
 Linear algebra I (MA341)—fall 2002.

**Courses taught at Purdue University:**

Geometry (for Secondary School Teachers)—spring 2002.  
 Ordinary Differential Equations—spring 2000, 2002.  
 Introduction to Linear Algebra—fall 1999, 2000, and 2001.  
 Introduction to Discrete Mathematics—fall 2000, 2001.  
 Honors Multi-Variable Calculus—spring 2000.  
 Business Calculus—spring 2001.

### **Courses taught at Massachusetts Institute of Technology:**

Lecturer for Mathematical Methods for Engineers—August 1998.

Recitation Instructor for Complex Analysis—spring 1998.

Recitation Instructor for Multivariable Calculus—fall 1997.

Mentor for the Research Science Institute—summer 1996.

Instructor for M.I.T.'s Experimental Studies Group (teaching multivariable calculus)—fall 1995.

### AWARDS

**Thomas F. Herman Award for Specialized Pedagogy**, University of Oregon, 2015.

**Williams Fellowship**, University of Oregon, 2007–2008.

**Alfred P. Sloan Dissertation Fellowship**, held at M.I.T. September 1998 to May 1999.

**National Science Foundation Graduate Fellowship**, held at M.I.T. Sept. 1994 to Aug. 1997.

### INVITED ADDRESSES

“Surfaces with involution”, Equivariant and Motivic Homotopy Theory, Isaac Newton Institute of Mathematical Sciences, Cambridge, UK, August 13–17, 2018.

“Topology from the early days.” Series of five lectures given at the Algebraic Topology Summer School held by the Gulbenkian Foundation in Lisbon, Portugal, July 24–28, 2017.

“Motivic stable homotopy groups of spheres”, Cascade Topology Seminar, University of Washington, November 2–3, 2013.

“Motivic homotopy groups of spheres”, Northwestern Workshop on Equivariant, Chromatic, and Motivic Homotopy Theory, Evanston, IL, March 25–29, 2013.

“Motivic stable homotopy groups of spheres”, Fourth Arolla Conference on Algebraic Topology, Arolla, Switzerland, August 2012.

“Motivic characteristic classes for quadratic bundles”, Algebraic Topology: Applications and New Directions, Stanford Symposium 2012, July 2012.

“Characteristic classes for  $Z/2$ -equivariant bundles”, Midwest Topology Seminar, Spring 2012, Purdue University.

“Bigraded equivariant cohomology of  $Z/2$ -equivariant Grassmannians”, Special Session on Homotopy Theory at the AMS National Meeting in Boston, MA, January 2012.

“From the reduction theorem to the slice theorem”, MSRI Workshop, Hot Topics: Kervaire Invariant, October 25–29, 2010.

“Motivic stable homotopy groups”, Southern California Algebraic Geometry Seminar, USC, Los Angeles, November 2009.

“Motivic stable homotopy groups”, Cascade Topology Seminar, Vancouver, April 2009.

“Motivic stable homotopy groups”, Homotopy Theory and Applications, Lincoln, NE, April 2009.

“Motivic weights in the classical Adams spectral sequence”, combined PIMS–AMS Sectional meeting, Vancouver, fall 2008.

“Quadratic structures in motivic homotopy theory.” Midwest Topology Seminar, Winter 2007, University of Illinois at Chicago.

“Motivic homotopy theory.” Topics in Homotopy Theory Graduate Summer School, PIMS & University of Calgary, August 2005.

“Composition formulas for quadratic forms in characteristic  $p$ .” Special session on homotopy theory at the AMS Regional Meeting in Boulder, CO, October 2003.

“Motivic cell decompositions.” Cascade Topology Seminar, Spring 2003, Portland State University.

“Voevodsky theory (Homotopy Theory of Schemes)” (3 lectures). Minimal Varieties in Geometry and Physics (A Conference on the Occasion of Blaine Lawson’s 60th Birthday), June 2002, SUNY at Stony Brook.

“Topological equivalences for DGAs.” Special session on algebraic topology at the AMS Regional Meeting in Ann Arbor, MI, Spring 2002.

“Equivariant cycles and  $KR$ -theory.” Midwest Topology Seminar, Spring 2001, University of Illinois at Chicago.

“Universal homotopy theories, with applications.” Ontario Topology Seminar, Fall 2000, University of Western Ontario.

“Betti numbers of almost complete intersections.” Special session on commutative algebra at the American Mathematical Society annual meeting, San Francisco, CA, January 1995.

#### SELECTED SEMINAR TALKS

“Scissors congruence and Hilbert’s third problem.” Reed College Math Colloquium, November 29, 2019.

“Bigraded Bredon cohomology for  $Z/2$ -spaces.” Electronic Computational Homotopy Theory Seminar, hosted by Wayne State but streamed live on the internet, November 16, 2017.

“Involutions on surfaces.” Wayne State Topology Seminar, February 28, 2017.

“Elliptic curves and Pascal’s theorem.” Reed College Math Colloquium, April 14, 2016.

“Motivic stable homotopy groups of spheres.” Wayne State University Topology Seminar, October 9, 2012.

“Rigidification of quasi-categories.” Wayne State University Topology Seminar, January 26, 2010.

“Motivic stable homotopy groups.” Stanford Topology Seminar, January 27, 2009.

“Motivic Stiefel-Whitney classes.” Topology seminar, MIT, July 30, 2008.

“Motivic stable homotopy groups.” Topology seminar, MIT, September 17, 2007.

“Motivic characteristic classes.” Summer topology seminar, Stanford, August 2007.

“Sums-of-squares formulas and motivic homotopy theory.” Colloquium, University of Illinois at Chicago, February 23, 2007.

“The Milnor conjecture”. Topology seminar, Wayne State University, April 18, 2006.

“Motivic cohomology for everyone”. Colloquium, Wayne State University, April 17, 2006.

“Characteristic classes for quadratic bundles”. University of Chicago, September 2004.

“Topological methods in characteristic  $p$  algebra.” MIT, September 2003.

“Topological equivalences for DGAs.” University of Washington, April 2003.

“Homotopy endomorphism spectra and DGAs.” University of Chicago, December 2002.

“Motivic cohomology for the masses.” Colloquium, University of Oregon, February 2002.

“Hypercovers and simplicial presheaves.” MIT, Fall 2001.

“Computing the motivic Steenrod algebra.” University of Notre Dame, Spring 2001.

“A motivic spectral sequence for Atiyah’s  $KR$ -theory.” University of Illinois at Urbana-Champaign, Spring 2000.

“An introduction to motivic topology”, Instituto Superior Técnico (Lisbon), June 2000.

“Some connections between  $K$ -theory and motivic cohomology.” Texas A&M University, October 1999.

“Adventure and romance in the homotopy theory of schemes.” M.I.T. Summer Topology Seminar, 1997.

“Cohomology of finite group schemes over a field, after Friedlander and Suslin.” M.I.T. Summer Topology Seminar, 1996

OTHER CONFERENCES ATTENDED:

BIRS workshop: Equivariant stable homotopy theory and  $p$ -adic Hodge theory, March 1–6, 2020.

Equivariant topology and derived algebra, NTNU, Trondheim, Norway, July 29–August 2, 2019.

Homotopy theory in the ecliptic: chromatic, equivariant, and motivic mathematics, Reed College, Portland, OR, August 18–21, 2017.

Homotopy theory: tools and applications, University of Illinois, July 17–21, 2017.

Obwerwolfach workshop: Factorization algebras and functorial field theories, May 8–14, 2016.

BIRS workshop: Equivariant derived algebraic geometry, February 14–19, 2016.

Oberwolfach workshop: Homotopy theory, March 8–14, 2015.

BIRS workshop: Triangulated categories and applications, June 12–17, 2011.

DEPARTMENTAL AND UNIVERSITY SERVICE

2017–present: Department Head

2020 (January)–present: Data Science Academic Leadership Team (note: this committee has only met once so far).

2019 (Fall): Supervisor of Vitulli Scholars Project for six students.

2017–2020: Chair of Climate Committee.

2016–2017: Associate Department Head, Chair of Undergraduate Affairs Committee, Executive Committee, Post-Tenure Review Committee.

2015–2016: Associate Department Head, Chair of Undergraduate Affairs Committee, Executive Committee, Post-Tenure Review Committee; University Academic Requirements Committee, Department of Education Studies Search Committee (mathematics education search), University Search Committee for CAS Dean; Interim Department Head during summer session.

2014–2015: Associate Department Head, Chair of Undergraduate Affairs Committee, Executive Committee, Scholarships & Awards Committee; University Academic Requirements Committee, Columbia 150 Redesign Committee; Interim Department Head during summer session.

2013–2014: Chair of Undergraduate Affairs Committee, Scholarships & Awards Committee. Interim department head July 1, 2014–September 14, 2014.

2012–2013: Sabbatical year.

2011–2012: Graduate Appointments Committee.



2010–2011: Executive Committee, Assessment Committee (chair). Also served as chair of the CAS Curriculum Committee.

2009–2010: Executive Committee, Teaching Effectiveness, Assessment Committee (chair). Also served on the CAS Curriculum Committee.

2008–2009: Executive Committee, Graduate appointments, Teaching Effectiveness, Library Committee. Also served on the University's Faculty and Promotion Committee.

2007–2008: Executive Committee, Tenure-track Search Committee, Graduate Affairs Committee.

2006–2007: Colloquium Committee, Postdoctoral Search Committee, Graduate Affairs Committee.

2005–2006: Undergraduate Affairs Committee, Executive Committee, Graduate Appointments Committee. IntroDuction advisor, Summer 2005.

2004–2005: Undergraduate Affairs Committee. IntroDuction advisor, Summer 2004. Web-site committee. OIMT afternoon activities committee, Spring 2005.

#### OTHER SERVICE

Co-organizer, with D. C. Isaksen and C. Hazel, for the Algebraic Topology Employment Network, October 2020.

Editor for Homology, Homotopy, and Applications (February 2010–Summer 2015).

AMS Menger Prize Committee 2013–2014, 2014–2015.

AMS Western Section Program Committee for 2011–2012 and 2012–2013 (chair for 2012–2013).

Have refereed 53 papers for *Advances in Math.*, *Trans. Amer. Math. Soc.*, *K-theory*, *Doc. Math.*, *Jour. Pure Appl. Alg.*, *Compositio Math.*, *Math. Zeit.*, *Geom. Topol.*, *Canad. J. Math.*, and *Homology Homotopy Appl.*, *Alg. Geom. Topol.*, *Glasgow Math. Journal*, *Journal of K-theory*, and *Journal of the AMS*.

Organized, with H. Sadofsky, the Special Session on Applications of Algebraic Topology at the AMS Regional Meeting in Eugene, OR, November 2005.

Organized, with B. Shipley, the Special Session on Homotopy Theory at the AMS Regional Meeting in Boulder, CO, October 2003.