# VITA:  Robert Speiser

May 1, 2015

*Education*:

A.B. in mathematics, Columbia College, 1965
Ph. D. in mathematics, Cornell University, 1970
(Advisor: Stephen Lichtenbaum. Field: algebraic geometry.)

*Career:*

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| 1970–71 | Research Associate, Center for Research in Education, Cornell University (Postdoctoral supervisors: Herbert P. Ginsburg and Robert B. Davis); taught concurrently at the East Hill  Elementary School, Ithaca, New York. |
| 1971–73 | Assistant Professor, Department of Mathematics, University of Texas at Austin. |
| 1973–84 | Assistant Professor, Associate Professor, Professor, Department of Mathematics, Illinois State University. |
| 1978–80 | Visiting Associate Professor, School of Mathematics, University of Minnesota, Minneapolis. |
| 1984–2000 | Professor, Department of Mathematics, Brigham Young University. |
| 1986–87 | Guest Professor, *Institut Mittag-Leffler* (Djursholm, Sweden), supported by the Swedish Academy of Science. |
| 1992 | Senior Member, Mathematical Sciences Research Institute (Berkeley), Fall Semester. |
| 1992–93 | Associate Dean, College of Physical and Mathematical Sciences, Brigham Young University. |
| 1998–2009 | Editor (with Carolyn Maher), Journal of Mathematical Behavior. |
| 1999–2001 | Visiting Professor of Mathematics Education, Graduate School of Education, Rutgers University. |
| 2001–2009 | Professor of Mathematics Education, Brigham Young University. |
| 2009–present | Professor Emeritus, Brigham Young University. |
| 2009–2014 | Visiting Scientist, Smithsonian Astrophysical Observatory, Harvard University. |

Honors

*For research:*

Mathematical publication 3. below was reported in the *Séminaire Bourbaki*, Nov. 1974, by J.-F. Boutot (Springer Lecture Notes, 1975). The *Séminaire Bourbaki* is a semiannual lecture series, held in Paris for the French mathematical community, to report on the most significant new work.

*For teaching:*

Outstanding Teacher Award, BYU, 1986. Each year the graduating seniors in mathematics choose the person they think is the best teacher in the department.

*For teaching and scholarship:*

Alcuin Fellowship in General Education, BYU, 1991-94. Three years of research support, awarded by a faculty committee, to recognize both significant scholarship and strong teaching in honors and general education courses.

Some invited lectures

*In mathematics*:

Berkeley (1972).

*Ecole Normale Supérieure*, Paris (1975).

Kings' College, University of London (1975).

MIT (9 times, 1979–93).

Swedish Math. Soc. Winter Meeting: plenary (1987).

MSRI, Berkeley (led a seminar in algebraic geometry, Fall 1992).

Harvard (1993).

*In mathematics education*:

Robert B. Davis Institute for Learning, Graduate School of Education, Rutgers: at least one seminar or colloquium presentation per academic year from 1997 through 2009.

Mathematics Association of America, special interest group (SIGMAA) in undergraduate mathematics education (RUME): plenary, Chicago (2000).

Universities of Gothenberg and Umeå (Sweden): two colloquia and seven two-hour presentations; organized a series of discussions with mathematicians and mathematics educators; supported by Swedish Research Council (March 2002).

International Group for the Psychology of Mathematics Education, North American Chapter (PME-NA): plenary, Toronto (2004).

Seoul National University (Korea), College of Education: Two colloquia and a seminar (November, 2006).

Further presentations

International Conference on the Teaching of Statistics, Singapore: led two one-hour sessions (1988).

NCTM Research Pre-session: organized a 150-minute work session, SanFrancisco (1999).

AERA Annual Meeting: organized a 2-hour interactive symposium, New Orleans (2000).

National Council of Teachers of Mathematics (NCTM), Research Presession: discussant (papers by Yackel, Rasmussen, Stephan and Whitenack), Las Vegas (2002).

PUBLICATIONS: MATHEMATICS

<u>Research papers</u>

1. Cohomological Dimension and Abelian Varieties, Amer. J. Math. **95** (1973) 1-34.

2. Cohomological Dimension of Noncomplete Hypersurfaces, Invent. Math. **21** (1973) 143-150.

3. (with Robin Hartshorne) Local Cohomological Dimension in Characteristic p>0, Ann. of Math. **105** (1977) 45-79.

4. Projective Varieties of Low Codimension in Characteristic p>0, Trans. Am. Math. Soc **240** (1978) 329-343.

5. Formal Meromorphic Functions and Cohomology on an Algebraic Variety, Nagoya Math. J. **77** (1979) 125-135.

6. Extending Meromorphic Functions on $\mathbf{P}^m \times \mathbf{P}^n$, J. Reine Angew. Math. **305** (1979) 126-133.

7. Extending Meromorphic Functions on a Grassmann Variety, Invent. Math. **62** (1981) 381-391.

8. Vanishing Criteria and the Picard Group for Projective Varieties of Low Codimension, Compos. Math. **42** (1981) 13-21.

9. (with J. Roberts) Schubert's Enumerative Geometry of Triangles from a Modern Viewpoint, in Proc. Midwest Alg. Geom. Conf. 1980, Springer L. N. **862** (1981) 272-281.

10. Triple contact of Plane Curves: Schubert's Enumerative Theory, Proc. AMS Summer Inst. (Arcata) 1982, AMS Symposia in Pure Math. 40 (1983) 507-511.

11. (with J. Roberts) Enumerative Geometry of Triangles, I, Comm. Algebra **12** (10) (1984) 1213-1255.

12. (with J. Roberts) Enumerative Geometry of Triangles, II, Comm. Algebra **14** (1) (1986) 155-191.

13. (with J. Roberts) Enumerative Geometry of Triangles, III, Comm. Algebra **15** (9) (1987) 1929-1966.

14. (with S. Kleiman) Enumerative Geometry of Cuspidal Plane Cubics, Proc. 1984 Vancouver Conf., Canad. Math. Soc. Proc. **6** (Providence, 1986) 227-268.

15.  Enumerating Contacts, Proc. AMS Summer Institute, Bowdoin 1986, Proc. of Symposia in Pure Math, AMS (Providence, 1987) 401-420.

16.  (with S. Kleiman)  Enumerative Geometry of Nodal Plane Cubics, Proc. 1986 Sundance Conf., Springer L. N. **1311** (1988) 156-196.

17.  Transversality Theorems for Algebraic Families of Maps, Proc. 1986 Sundance Conf., Springer L. N. **1311** (1988) 235-252.

18.  (with D. Laksov) Transversality Criteria in Any Characteristic, Proc. 1987 Sitges Conf., S. Xambo-Descamps, Ed., Springer L. N. **1436** (1990) 139-150.

19.  (with S. Kleiman) Enumerative Geometry of Nonsingular Plane Cubics, Proc. 1988 Sundance Conf., Contemp. Math., **116** (1990) 85-114.

20.  Limits of Conormal Schemes, Proc. 1988 Sundance Conf., Contemp. Math., **116** (1990) 129-146.

21.  (with D. Eisenbud, N. Elkies and J. Harris)  On the Hurwitz Scheme and its Monodromy, Compositio Math. **77** (1991) 95-117.

22.  (with D. Laksov)  Determinantal Criteria for Transversality of Morphisms, Pacific J. Math. **156** (1992) 95-117.

23.  Derived Triangles and Differential Systems, in Projective Geometry with Applications, edited by Edoardo Ballico, Marcel Dekker (1994) 97-110.

24.  (with E. Arondo and I. Sols) Global Moduli for Contacts, Arkiv før Matematik **35** (1997) 1-57.  (An earlier version appeared as MSRI Preprint 021-93.)

25.  (with Dan Laksov)  Local and Global Equations for Effective Data, Comm. in Algebra **31** (2003) 3993-4006.

Books

1.  (edited, with Audun Holme) *Algebraic Geometry, Sundance 1986*, Springer Lecture Notes in Mathematics, **1311** (1988).

2.  (edited, with Brian Harbourne) *Algebraic Geometry, Sundance 1988*, Contemporary Mathematics (Amer. Math. Soc.) **116** (1990).

PUBLICATIONS: MATHEMATICS EDUCATION

Research papers

1. (with Chuck Walter)  Catwalk: First Semester Calculus, Journal of Mathematical Behavior v. 13 (1994) 135-152.

2. (with Chuck Walter)  Constructing the Derivative in First-Semester  Calculus, Proceedings, International Group for the Psychology of Mathematics Education, North American Chapter (PME-NA XVI), Baton Rouge, LA (1994) 116-122.

3.  Second Catwalk: Narrative, Context, Embodiment, Journal of Mathematical Behavior v. 15 (1996), 351-371.

4. What it Means to Go Around the Block, Journal of Mathematical Behavior v. 16 (1997), 5-6.

5. (with Chuck Walter)  Performing Algebra: Emergent Discourse in a Fifth-Grade Classroom, Journal of Mathematical Behavior v. 16 (1997), 39-49.

6.  Block Towers and Binomials, Journal of Mathematical Behavior v. 16 (1997), 113-124.

7. (with Carolyn Maher)  How Far Can You Go With Block Towers? Journal of Mathematical Behavior 16 (1997), 125-132.  (An earlier version appeared in the Proceedings of the International Group for the Psychology of Mathematics Education (PME 21), Lahti, Finland, (1997) v. 4, pp. 174-181.)

8. (with Chuck Walter)  Chapter 4:  Investigating a Sampling Problem.  (In Carolyn Maher, Can Teachers Help Children Make Convincing Arguments?  A Glimpse Into the Process.)  Rio di Janeiro: Universidade Santa Ursula, (1998).

9. (with Chuck Walter)  Two Dice, Two Sample Spaces.  Proc. Fifth Int. Conference on Teaching of  Statistics, Singapore (ICOTS-5), Int. Statistical Institute (1998), v. 1, pp. 61-66.

10. (with Carolyn Maher, Clifford Konold and Susan Friel)  Learning to Reason Probabilistically. Proceedings, International Group for the Psychology of Mathematics Education, North American Chapter (PME-NA XX), Raleigh, NC (1998), 82-87.

11. (with Regina Kiczek and Carolyn Maher) Tracing the Origins and Extensions of Michael's Representation. NCTM Yearbook 2001: The Role of Representations in School Mathematics (2001).  Reston, VA: National Council of Teachers of Mathematics, 201-214.

12. (with Carolyn Maher) Polynomials, Pascal's Triangle and the Building of Isomorphisms. Presentation at the Annual Meeting of the American Educational Research Association. Seattle, WA, April, 2001.

13. (with Chuck Walter and Carolyn Maher) Representing Change. Proceedings, International Group for the Psychology of Mathematics Education (PME 25, Utrecht, 2001), v.4, 209-216.

14. (with Chuck Walter, Harold Melnick, Alejandro Rivera and Tiffini Christensen) Five African Eighth-Graders in West Harlem Tackle a Division Problem. Proceedings, International Group for the Psychology of Mathematics Education, North American Chapter (PME-NA XXIV), Athens, GA (2002), v. 2, 1051-1054.

15. (with Chuck Walter and Becky Shull) Preservice Teachers Undertake Division in Base Five: How Inscriptions Support Thinking and Communication. Proceedings, International Group for the Psychology of Mathematics Education, North American Chapter (PME-NA XXIV), Athens, GA (2002), v. 3, 1152-1162.

16. How Does Building Arguments Relate to the Development of Understanding? (2002) JMB, v. 21, 491-497.

17. (with Chuck Walter and Carolyn Maher) Representing Motion: an Experiment in Learning (2003). JMB, v. 22, 1-35.

18. (with Chuck Walter) Getting at the Mathematics: Sara's Journal. [Brief preliminary version of item 23 below] Proceedings, International Group for the Psychology of Mathematics Education (PME 27, Honolulu, 2003), v.4, 245-249.

19. (with Chuck Walter) Remembering Stanley Erlwanger. For the Learning of Mathematics v. 24(3) (2004) 34-39.

20. (with Chuck Walter and Tara Lewis) Talking Through a Method. For the Learning of Mathematics v. 24(3) (2004) 40-45.

21. (with Chuck Walter) Placenticeras: Evolution of a Task. Journal of Mathematical Behavior v. 23 (2004), 259-269.

22. Experimental Teaching as a Way of Building Bridges. Plenary paper, proceedings of the 2004 annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, Toronto, Ont., Canada, v. 1, 21-36.

23. (with Chuck Walter and Tiffini Glaze) Getting at the Mathematics: Sara's story. [Full version of 18 above.] Educational Studies in Mathematics v. 58 (2005) 189-207.

24. (with Chuck Walter and Carole Sullivan) From Test Cases to Special Cases: Four Education Undergraduates Unpack a Formula for Combinations. Journal of Mathematical Behavior 26 (2007) 11-26.

25.  (with Chuck Walter) Rethinking Change. In *Making the connection: Research and teaching in undergraduate mathematics*; MAA Notes, no. 73 (M. Carlson & Rasmussen, C., eds.). Washington, DC: Mathematical Association of America (2008), 15-25.

26.  (with Christine Larson, Guershon Harel, Mchael Oehrtman, Chris Rasmussen, Chuck Walter & Michelle Zandieh) Analyzing different modeling perspectives in undergraduate mathematics education. *Proceedings of the 13th biennial meeting of the International Community of Teachers of Mathematical Modelling and Applications (ICTMA 13, Bloomington, Indiana).* Springer-Verlag, 2008.

27.  (with Chuck Walter) Models as tools, especially for making sense of problems. *Proceedings of the 13th biennial meeting of the International Community of Teachers of Mathematical Modeling and Applications (ICTMA 13, Bloomington, Indiana).* (2008), 15-25.

28.  Block towers: From concrete objects to conceptual imagination. A chapter in *Combinatorics and reasoning: Representing, justifying, and building isomorphisms* (C.A. Maher, A. Powell, & E. B. Uptegrove, Eds.).  New York: Springer-Verlag; 2009, 73–86.

29.  (with Kellyn Farlow Morris) Probing for reasons: Presentations, questions, phases.  Journal of Mathematical Behavior 29 (2010), 125-144.

30.  (with Chuck Walter) Models for products. (2011). Journal of Mathematical Behavior 30 (2011) 271-290.

31. (with Matthew H. Schneps, Gerhard Sonnert, Amanda Heffner-Wong & Jaimie L. Miller). Why is paper-and-pencil multiplication difficult for many people?  Journal of Mathematical Behavior 31 (2012) 463-475.

32. (with Chuck Walter).  Making sense of fraction quotients, one cup at a time.  Journal of Mathematical Behavior 38 (2015) 1-8.


Further articles:

1. (with Robert B. Davis and Carolyn A. Maher)  How should we think about pre-college mathematics?   Mathematics and Education Reform (MER) Newsletter 10 (1), (1997), p. 3.

2.  (with Herbert P. Ginsburg and Carolyn A. Maher)  In memoriam, Robert B. Davis (1926-1997), Journal of Mathematical Behavior 16, (1998), p. 85.

3.  (with Ann Anderson)  Current problems and challenges in pre-school mathematics education. *Report of Discussion Group 17, Proceedings of the 10th international congress of mathematics education (ICME10, Copenhagen, 2004).* Roskilde: IMFUFA, Roskilde University (2008) 498-503.

4.  (with Chuck Walter) Following the cat: A preface for the next three papers.  Journal of Mathematical Behavior (2009), 243-245.

Books:

1. (with Chuck Walter): *Five Women Build a Number System.* Stamford, CT: Ablex, 2000.

2. (edited, with Chuck Walter and Carolyn Maher): *Proceedings of the 23rd annual meeting of the International Group for the Psychology of Mathematics Education, North American Chapter (PME-NA XXIII)*, *Snowbird Utah, October 18-21, 2001*, 2 vols.

Videos, films:

1. *Surprises in Mind.* A one-hour public television documentary on learning mathematics, emphasizing creativity and problem-solving in contexts ranging from infancy and preschool (Susan Carey, Herbert Ginsburg) to architecture (Frank Gehry) to industry (Patagonia). In a segment filmed at BYU, art students and preservice elementary teachers work with extended tasks from my research, and a group of faculty from several disciplines discuss potential implications. Produced by the Harvard-Smithsonian Center for Astrophysics. Burlington, VT: Annenberg/CPB (2001). (www.learner.org/resources/series130.html)

2. *Possibilities of Real-Life Problems.* (A one-hour video workshop for teachers.) Workshop 6 of *A Private Universe in Mathematics*, produced by the Harvard-Smithsonian Center for Astrophysics in collaboration with the Robert B. Davis Institute for Learning, Rutgers University. Burlington, VT: Annenberg/CPB (2001). This video workshop explores student work and thinking during an extended task investigation, drawn from my research on how students work mathematically with change and rates of change. (For further details, see paper 17 above). I designed the learning task, helped plan and lead the student sessions, helped edit the video, and gave voice-over narration, interpretation and analysis, and helped to write and edit printed support materials and study guides for the participating teachers. The full series of seven workshops has been broadcast several times a year over the past five years on public television, and has been seen by several thousand teachers in the US. (http://www.learner.org/channel/workshops/pupmath/)

EDITORSHIPS

Editor (with Carolyn Maher: Journal of Mathematical Behavior (Elsevier Science), 1998-2009.

Editor (with Carolyn Maher): the monograph series Mathematics, Learning and Cognition: Monographs of the Journal of Mathematical Behavior. Greenwood Press (Elsevier), 1998-2002.

OFFICES HELD

International Group for the Psychology of Mathematics Education, North American Chapter (PME-NA): Chair of the organization for 2000-2001; member of the steering committee for 1999-2002. Organized the national meeting at Snowbird, Utah, October 2001.

SOME SESSIONS CHAIRED

Work Session (150 minutes): *Tracing the Growth of Mathematical Understanding.* Participants: Carolyn Maher, Mercedes McGowen, Elena Steencken.  Research Pre-session, National Council of Teachers of Mathematics, San Francisco, April 20, 1999.

Interactive Symposium (2 hours): *The Development of Mathematical Thinking Over Time.* (Three roundtables.  Participants included Susan Pirie, Sarah Berenson , Neil Pateman, Arthur Powell, and Carolyn Maher.)  American Educational Research Association (AERA), New Orleans, April 26, 2000.

International Group for the Psychology of Mathematics Education, North American Chapter (PME-NA): Chaired the national meeting, Snowbird, Utah, October 18-21, 2001.

International Congress of Mathematics Education (ICME): Co-chair (with Ann Anderson, University of British Columbia) Discussion Group 17, Early Childhood Mathematics Education (Copenhagen, Denmark, July 4–11, 2004).

MEETINGS ORGANIZED

*In Mathematics:*

I organized four research-oriented conferences at Sundance, the ski resort near Provo, Utah owned by Robert Redford.  These conferences, held in late spring or summer, lasted for one week and involved 25-30 invited participants. Three had NSF support.

1.  Enumerative algebraic geometry / Sundance 86. Participants included Steve Kleiman (MIT), David Eisenbud (Brandeis), Lawrence Ein (University of Illinois, Chicago).  Supported by NSF (grant DMS-860149) and BYU.

2. Algebraic Geometry / Sundance 88.  Participants included Bill Fulton (Chicago), Joe Harris (Harvard), Steve Kleiman (MIT), Mark Green (UCLA).  Supported by NSF (grant DMS-871923) and BYU.

3.  Commutative Algebra and Algebraic Geometry / Sundance 90.  Participants included David Eisenbud (Brandeis), Craig Huneke (Purdue), George Kempf (Johns Hopkins), Paul Roberts (University of Utah).  Supported by BYU.

4. Arithmetic Algebraic Geometry / Sundance 92.  Participants included J.-P. Serre (Collège de France), Ken Ribet (Berkeley), Niels Nygaard (Chicago), Barry Mazur (Harvard), Nicholas M. Katz (Princeton), Karl Rubin (Ohio State).  Supported by NSF (grant DMS-9114629) and BYU.

*In Mathematics Education:*

With collaborators at Rutgers, I initiated a series of invited international conferences, each for about 20 specialists and teachers from a range of countries, to focus on current research and collaboration. Three conferences in this series took place at Snowbird, the ski resort near Salt Lake City, and one was held at Beer Sheva, Israel (Item 2 below). Further meetings are anticipated.

1. Childen's Mathematical Thinking / Snowbird 97. Organized in collaboration with Robert B. Davis and Carolyn A. Maher (Graduate School of Education, Rutgers), June 9-15, 1997. Supported by Rutgers and Brigham Young Universities. Participants included Leslie P. Steffe (Georgia), Shlomo Vinner (Jerusalem), Brian Greer (Belfast), Robert B. Davis, Carolyn A. Maher and Alice Alston (Rutgers), Erna Yackel (Purdue), Susan Pirie (Vancouver) and Daniel A. Goroff (Harvard, Presidential Science Advisor).

2. Children's Mathematical Thinking / Beer Sheva, Israel 98. Organized in collaboration with Carloyn A. Maher (Rutgers) and Shlomo Vinner (Beer Sheva), May 24-28, 1998. Participants included Herbert P. Ginsburg (Columbia), Willibald Doerfler (Klagenfurt, Austria), Miriam Amit (Israel Ministry of Education), Avraham Arcavi (Weitzmann Institute, Israel), and Brian Greer (Belfast). This conference included a three-hour transatlantic teleconference with participants at three sites in New Jersey, including working teachers.

3. Children's Mathematical Thinking / Snowbird 99. Organized in collaboration with Carloyn A. Maher (Rutgers), May 22-29, 199. Participants included Gila Hanna (Toronto), Susan Pirie (Vancouver), Gary Davis (Southhapton, England), Matthew Schneps (Smithsonian Center for Astrophysics, Harvard), Neil Pateman (Hawaii), Sarah Berenson (NC State) Eugenia Etkina (Rutgers), Jean Moon (Exxon Foundation), Alice Alston (Rutgers) and Chuck Walter (BYU).

4. Children's Mathematical Thinking / Snowbird 2000. Organized in collaboration with Carloyn A. Maher (Rutgers) and Chuck Walter (BYU), June 10-15, 2000. Participants included Susan Pirie (Vancouver), Matthew Schneps (Smithsonian Center for Astrophistcs, Harvard), Willibald Doerfler (Klagenfurt), Nitsa Movshovitz-Hadar (Technion and Israel Science Museum), Erna Yackel (Purdue), Gary Davis (Southampton, England), Sarah Berenson (NC State), Neil Pateman (Hawaii) and Gunnar Gjone (Oslo).

5. Robert B. Davis Conference on Mathematics Education / Honolulu 2001. Organized in collaboration with Carolyn Maher (Rutgers), Neil Pateman (University of Hawai'I) and Charles Walter (BYU). Participants included Miriam Amit (Beer-Sheva University and Ministry of Education, Israel), Susan Pirie (Vancouver), Willibald Doerfler (Klagenfurt), Nitsa Movshovitz-Hadar (Technion and Israel Science Museum), Gila Hanna (Toronto), and Gunnar Gjone (Oslo).

6. International Group for the Psychology of Mathematics Education, North American Chapter: annual meeting (PME-NA XXIII) at Snowbird Utah, October 18-21, 2001. Organized jointly with Carolyn Maher, with sponsorship from Rutgers and BYU.

7.  Robert B. Davis Conference on Mathematics Education / Klagenfurt, 2002. Organized in collaboration with Carolyn Maher (Rutgers) and Willibald Dörfler (Klagenfurt). Klagenfurt, Austria, June 2-6, 2002.

8.  U.S.-Norway Cooperative Workshop: Building from Prototypes: / Umeå, Sweden, 2003. An NSF-sponsored international workshop, organized (I was a co-PI) in collaboration with Carolyn A. Maher, Rutgers (PI) and Gunnar Gjone (Oslo). Co-organizers at Umeå were Johan Lithner and Tomas Bergquist. Participants included Willi Dörfler (Klagenfurt), Miri Amit (Beer Sheva), Sally Berenson (North Carolina State), Mary Ann Huntley (Delaware) and Chris Rasmussen (San Diego State).

9.  International Congress of Mathematics Educators (ICME): with Ann Anderson (University of British Columbia) I co-chaired Discussion Group 17 on early childhood mathematics education for ICME 10, Copenhagen (2004).

GRADUATE STUDENTS

*At Rutgers:*

After Bob Davis died in December 1997, his graduate students worked with Carolyn Maher, who invited me to become an external member of several committees. During my two years (1999-2001) at Rutgers, I worked intensively with these students and several new ones. These students, with the dates of their degrees (Ed. D. unless stated) are as follows. Regina Kiczek (2000), Elena Steencken (2001), Barbara Glass (2001), Sylvia Bulgar (2002), Arthur Powell (Ph. D. 2003), Lynn Tarlow (2004), Janet Walter (2004) and Lisa Warner (2005). I serve currently on two committees as external member, for Brad Halien and Maria Steffero.

*At BYU:*

There is a masters' program but no doctoral degree. My students have been Carole Sullivan (1998), Rebecca Gwilliam (2004), Tiffini Glaze (2004), and Kellyn Farlow (2007).

GRANTS

*In mathematics:*

For research:

NSF grant DMS-880215, *Algebraic Curves and Transverse Families*, July 1988-June 1990, for 20,000 dollars.

For conferences:

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| NSF DMS-8601409 | Sundance 86 | 5,000 dollars |
| NSF DMS-8719233 | Sundance 88 | 11,000 dollars |
| NSF DMS-9114629 | Sundance 92 | 8,000 dollars |

*In mathematics education:*

1. Co-PI with Paul Cox, Juliana Boerio-Goates and Russell Osguthorpe, on the NSF grant DUE-9354038, *Systemic Renewal of Teacher Preparation and Mathematics and Science Education*. April 1994 through September 1995, 94,680 dollars.

2. PI: *Downstream the Rivers Join: Two Strands of Thoughtful Mathematics*. A one-year planning grant to me from the Exxon Educational Foundation, to support collaboration with the Liberty Elementary School (Murray Utah), and to help integrate mathematics courses, in content and methods, with methods practica for preservice elementary school teachers at BYU. Awarded April 1998, 19,400 dollars.

3. PI: *A Stronger, Wider Current*. An implementation grant to me from the Exxon Educational Foundation, to support collaboration with the Liberty Elementary School (Murray Utah), and several collaborating schools, and to help integrate mathematics courses, in content and methods, with methods practica for preservice elementary school teachers at BYU, through January, 2002. Awarded June 1999, 22,800 dollars.

4. Consultant (PI: Carolyn Maher) on the NSF-sponsored project *A Longitudinal Study of the Development of Proof Making in Students*, REC-9814846, 1999-2001, 639,500 dollars (with a supplemental grant for 99,457 dollars). My role in this project was to plan tasks for and lead instruction for the July 1999 student summer institute, and (working at Rutgers 1999-2001) collaborate in planning, analysis, writing and dissemination.

5. Co-PI with Carolyn Maher (Rutgers) for the U.S-Norway cooperative workshop, *Building from Prototypes: Learning and Teaching Mathematics in Collaboration*, Umeå, Sweden, June 12-16, 2003. NSF grant INT-0303660, awarded May 2003, 13,900 dollars. Follow-up meeting: Copenhagen, July 2004.

6. Co-PI, with Mattthew Schneps (PI) and Lincoln Greenhill (Harvard-Smithsonian Center for Astrophysics) on the NSF-sponsored project *Investigating Strengths People with Learning Differences Bring to STEM* (RDE-0930962), September 2009-August, 2010 (124,300 dollars; my subcontract 12,000 dollars). This demonstration project seeks to advance knowledge about the neurological differences associated with undergraduate students with dyslexia that can lead to advantages for visual processing and learning in STEM, by means of pilot-tested experiments and interventions, to serve as the basis for more advanced, robust investigations about the characteristics of undergraduate students with dyslexia that can lead to advantages for visual processing and learning.

## RECENT ACTIVITIES

*Funded research:*

Co-PI, with Mattthew Schneps (PI) and Lincoln Greenhill (Harvard-Smithsonian Center for Astrophysics), on the NSF-sponsored project, *Investigating Strengths People with Learning Differences Bring to STEM (*RDE-0930962) September 2009-August, 2010. (For details, see 6. just above.)