

# Sean P. Matt

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## PERSONAL DATA

Born April 25, 1974, Federal Way, Washington  
Citizenship: U.S.A.  
Marital Status: married with 2 children  
URL: <http://www.astro.virginia.edu/~spm5x>

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## EDUCATION

**Ph.D. in Astronomy**, University of Washington, 2002  
(advisors: **Robert Winglee**, Bruce Balick, & Karl-Heinz Böhm)  
**M.S. in Astronomy**, University of Washington, 1998  
**B.S. in Astronomy & Physics**, Cum Laude, University of Arizona, 1996

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## PROFESSIONAL APPOINTMENTS

2005- present: **Levinson/VITA (Prize) Postdoctoral Fellow** at the University of Virginia  
2004-2005: **Postdoctoral Research Associate** with Ralph Pudritz at McMaster University  
2004: **Instructor** of first year physics course at McMaster University  
2002-2004: **CITA National (Prize) Postdoctoral Fellow** at McMaster University  
1998-2002: **Research Assistant for Ph.D. thesis work** at the U. of Washington  
1998-1999: **Research Assistant** with George Wallerstein at the U. of Washington  
1997-1999: **Teaching Assistant** at U. of Washington  
1997: **Large Telescope Optics Shop Employee**, Rayleigh Optical Corp., Tucson AZ  
1996: **NSF/REU Summer Research Asst.** with George Simon at National Solar Observatory  
1995: **NSF/REU Summer Research Asst.** with Donald Neidig at National Solar Observatory

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## COMPUTING EXPERIENCE

- Experienced in high performance computing.
  - Author of 2D and 3D codes (in C) for HD, MHD, and radiative MHD simulations.
  - Attended NASA/GSFC Summer School (2000) in High Performance Computational Earth and Space Sciences: 3 week program, focused on developing software for parallel architectures.
  - Familiar with ZEUS-MP (v2) and FLASH codes.
  - Proficient in C and IDL programming languages, familiar with Fortran.
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## TEACHING EXPERIENCE

- Instructor of first year physics (PHYSICS 1B03) at McMaster U. (2004)
- Teaching Assistant for introductory astronomy (7 courses) at U. of Washington (1997-1999)
- Math & Physics Tutor (~150 hr.; 1997)

## RESEARCH EXPERIENCE

- While at **U. Virginia** (2005-present), I have carried out MHD simulations, analytic, and semi-analytic studies of stellar winds and angular momentum transfer to/from pre-main-sequence stars (with Pudritz); radiative cooling calculations and synthetic spectra (using CHIANTI) of T Tauri star coronal winds (with Pudritz); analysis of HI emission line survey data, using case B recombination theory to determine physical conditions of accreting gas in T Tauri stars (with Jeff Bary, NSF Fellow); simulations of “magnetorotational explosion” mechanism for expelling a stellar envelope (with Adam Frank & Eric Blackman, both at U. of Rochester); learning and testing ZEUS-MP (v2, an MHD code); supervised undergraduate project (Mary Miller); helped supervise continuing Ph.D. thesis work of George Trammell (MHD simulations of disk winds, supervisor Zhi-Yun Li).
- While at **McMaster U.** (2002-2005), I carried out analytic modeling of magnetic star-disk coupling and angular momentum of accreting stars (with Ralph Pudritz); MHD simulations of launching and shaping of stellar winds (with Bruce Balick); simulations of "magnetorotational explosion" mechanism (with Frank & Blackman); learning and testing FLASH (an MHD AMR code); MHD simulations of YSO jet launching and collimation (with Winglee & Böhm).
- For my **Ph.D. thesis work** at the U. of Washington (1998-2002), *The Influence of Poloidal Magnetic Fields on Astrophysical Outflows*: Using my own MHD simulation codes, I developed a mechanism for YSO jet launching and collimation (with Anthony Goodson, Winglee, & Böhm); developed MHD models for stellar winds in dipole fields (with Balick, Winglee, & Goodson).
- While a **Research Assistant** with George Wallerstein at the U. of Washington (1998-1999), I carried out an analysis of echelle spectra of Cepheid variable stars (also with Guillermo Gonzalez), using of Kurucz model atmospheres and the LTE line abundance code MOOG to determine the atmospheric abundances of these stars.
- While a **Summer Research Assistant** at NSO (1995 & 1996), I carried out processing and comparison of GONG and SOHO image data, supergranule studies, and giant cell search (with Simon); processing of solar coronagraph images, solar flare studies, and a search for Moreton waves (with Neidig).

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## ACADEMIC REFEREES ( \* = prepared to send letters)

\* **John Hawley**, Professor, Dept. Chair  
Department of Astronomy, U. of Virginia  
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\* **Ralph Pudritz**, Professor  
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**Adam Frank**, Professor  
Dept. of Physics & Astro., U. of Rochester  
Tel/Fax: (585) 275-1717/273-2813  
afrank at pas.rochester.edu

\* **Robert Winglee**, Professor, Dept. Chair  
Dept. of Earth & Space Sciences, U. of Washington  
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**Eric Blackman**, Professor  
Dept. of Physics & Astro., U. of Rochester  
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blackman at pas.rochester.edu

**Karl-Heinz Böhm**, Emeritus  
Department of Astronomy, U. of Washington  
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bohm at astro.washington.edu

## INVITED TALKS, MEETINGS/WORKSHOPS ATTENDED

6 Invited Conference Talks (1 review); 7 Department Colloquia; 5 Contributed Conference Talks

- **Oral Presentation: Winter 2008 AAS Meeting**, Austin TX  
*New Calculations of Magnetic Braking for Sun-Like Stars*
- **Contributed Talk: IAU Symposium No. 243, Star-Disk Interaction in Young Stars**, Grenoble, France, May 2007  
*The Nature of Stellar Winds in the Star-Disk Interaction*
- **Poster Presentation: Winter 2007 AAS Meeting**, Seattle WA  
*The Spin of Accreting Stars and Accretion-Powered Stellar Winds*
- **Invited Review Talk: 14<sup>th</sup> Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun**, Pasadena CA, Nov. 2006  
*Understanding the Spins of Young Stars*
- **Talk at UCSD/CASS**, San Diego CA, Sept. 2006  
*Stellar Winds and the Angular Momentum Problem*
- **Invited Talk: Colloquium at Vanderbilt University**, Nashville TN, Sept. 2006  
*Stellar Winds and the Angular Momentum Problem*
- **Invited Talk: ASIAA-TIARA Star Formation Workshop**, Taipei, Taiwan, Dec. 2005  
*Pre-Main-Sequence Stellar Winds: Hot or Cold, Weak or Bold?*
- **Invited Talk: TIARA Star Formation Program**, Hsinchu, Taiwan, Nov./Dec. 2005  
*Spin of Accreting Stars: Accretion Powered Stellar Winds vs. Disk Locking*
- **Poster Presentation: Protostars and Planets V Conference**, Kona HI, Oct. 2005  
*Spin of Accreting Stars: Accretion Powered Stellar Winds vs. Disk Locking*
- **Invited Talk: UVA Astronomy/NRAO Colloquium at UVa**, Charlottesville VA, Sept. 2005  
*Spinning Stellar Winds Winds Down Stellar Spinning*
- **Attended: Astrobiology Conference**, Hamilton ON, Canada, May 2005
- **Invited Talk: Colloquium at Lowell Observatory**, Flagstaff AZ, Mar. 2005  
*Stellar Winds Wound Down Stellar Spins and Other Teachings of Outflow Nebulae*
- **Invited Talk: Astronomy Colloquium at the Univ. of Wisconsin**, Madison WI, Sept. 2004  
*Solving the Stellar Angular Momentum Problem*
- **Invited Talk: Massive Stars: From Photospheres to Vinfinity** (Workshop to honor the career of Joe Cassinelli), Madison WI, Sept. 2004  
*Disk, Jet, and Lobe Formation by Winds in Rotating Dipole Magnetic Fields*
- **Invited Talk: Gravitational Collapse: From Massive Stars to Planets** (Workshop to honor the career of Peter Bodenheimer), Ensenada, Mexico, December, 2003  
*The Spin History of Protostars: Disk Locking, Revisited*

## INVITED TALKS, MEETINGS/WORKSHOPS ATTENDED (CONTINUED)

- **Attended: Workshop on Adaptive Mesh Refinement Methods**, Chicago IL, Sept. 2003
- **Invited Talk: Asymmetric Planetary Nebulae III** (Conference), Mt. Rainier WA, July 2003  
*The Last Hurrah: PPN Formation by a Magnetic Explosion*
- **Invited Talk: Phys/Astro Colloquium at McMaster U.**, Hamilton ON, Canada, July 2003  
*Fling! Twist! Pow! The Formation of Spectacular Outflow Nebulae*
- **Contributed Talk: June, 2003 CASCA Meeting**, Waterloo, ON  
*MHD Simulations of the Star-Disk Interaction: Accretion, Jet Formation, and Angular Momentum Exchange*
- **Invited Talk: Phys/Astro Colloquium at the Univ. of Rochester**, Rochester NY, Feb., 2003  
*How Magnetic Fields Shape Stellar Winds*
- **Poster Presentation: Winter 2003 AAS Meeting**, Seattle WA  
*Quadrupolar Outflow: A Single-Wind Model for the eta Carinae Nebula*
- **Invited Talk: Hamilton Amateur Astronomers Seminar**, Hamilton ON, Canada, Oct. 2002  
*Outflows During Stellar Birth and Death*
- **Contributed Talk: JENAM 2002 Conference: Jets 2002: Theory and Observations in YSO's**, Porto, Portugal, September 2002  
*Collimation of a Central Wind by a Disk-Associated Magnetic Field*
- **Contributed Talk: Eta Carinae: Reading the Legend Conference**, Mt. Rainier WA, July 2002  
*Simultaneous Production of Skirt & Lobes: A Preliminary Model*
- **Poster Presentation: Winter 2002 AAS Meeting**, Washington DC  
*Launch, Accrete, Repeat: Investigation of Disk Oscillations in an Episodic YSO Jet Formation Model*
- **Poster Presentation: Summer 2001 AAS Meeting**, Pasadena CA  
*Old Faithful: Simulation-Based Investigation of an Episodic Jet Formation Model*
- **2 week visit with Dr. Alejandro Raga** (May, 2001) at UNAM for personal instruction on including the effect of non-equilibrium, radiative cooling in my MHD codes.
- **NASA/GSFC Summer School** (2000) in High Performance Computational Earth and Space Sciences: 3 week program, focused on developing software for massively parallel architectures.
- **Poster Presentation: Summer 2000 AAS Meeting**, Rochester NY  
*Bipolarity Without Binarity: AGB Winds, Dipole Magnetic Fields, and Disk Formation*

## PUBLICATIONS

As of February, 2008:

**13** Refereed Publications; **11** First Author Ref'd Pubs; **8** Conference Proceedings

**240** Total Citations; **215** Citations to First Author Papers; **98** Normalized (Citations Per Author)

### ***Refereed Papers:***

- *Accretion-Powered Stellar Winds III: Spin Equilibrium Solutions*  
Matt, S., & Pudritz, R. E. 2008, **ApJ**, in press, arXiv:0801.0440
- *Accretion-Powered Stellar Winds II: Numerical Solutions for Stellar Wind Torques*  
Matt, S., & Pudritz, R. E. 2008, **ApJ**, in press, arXiv:0801.0436
- *Astrophysical Explosions Driven by a Rotating, Magnetized, Gravitating Sphere*  
Matt, S., Frank, A., & Blackman, E. G. 2006, **ApJ Letters**, 647, 45
- *Accretion-Powered Stellar Winds as a Solution to the Stellar Angular Momentum Problem*  
Matt, S. & Pudritz, R. E. 2005, **ApJ Letters**, 632, 135
- *The Spin of Accreting Stars: Dependence on Magnetic Coupling to the Disc*  
Matt, S. & Pudritz, R. E. 2005, **MNRAS**, 356, 167
- *Simultaneous Production of Disk and Lobes: A Single-Wind MHD Model for the Eta Car Nebula*  
Matt, S. & Balick, B. 2004, **ApJ**, 615, 921
- *Does Disk Locking Solve the Stellar Angular Momentum Problem?*  
Matt, S. & Pudritz, R. E. 2004, **ApJ Letters**, 607, L43
- *Collimation of a Central Wind by a Disk-Associated Magnetic Field*  
Matt, S., Winglee, R., & Böhm, K.-H. 2003, **MNRAS**, 345, 660
- *The Enigmatic HH 255*  
Matt, S. & Böhm, K.-H. 2003, **PASP**, 115, 334
- *Simulation-Based Investigation of a Model for the Interaction Between Stellar Magnetospheres and Circumstellar Accretion Disks*  
Matt, S., Goodson, A. P., Winglee, R. M., & Böhm, K.-H. 2002, **ApJ**, 574, 232
- *An Approximate Determination of the Gas-Phase Metal Abundance in Herbig-Haro Outflows and Their Shocks*  
Böhm, K.-H., & Matt, S. 2001, **PASP**, 113, 158
- *Disk Formation by Asymptotic Giant Branch Winds in Dipole Magnetic Fields*  
Matt, S., Balick, B., Winglee, R., & Goodson, A. 2000, **ApJ**, 545, 965
- *The carbon Cepheid RT Trianguli Australis: additional evidence of triple- $\alpha$ ; and CNO cycling*  
Wallerstein, G., Matt, S., & Gonzalez, G. 2000, **MNRAS**, 311, 414

### ***In Preparation:***

- *Measuring the Physical Conditions of Accreting Gas in T Tauri Systems*  
Bary, J. S., Matt, S., Skrutskie, M., Peterson, D., & Nelson, M. 2008, **ApJ**, in preparation
- *Spin Evolution of Magnetized Young Stars: The Effect of the Opening of the Stellar Field*  
Pinzón, G., de la Reza, R., & Matt, S. 2008, **ApJ**, in preparation
- *Comparison of Angular Momentum Loss Models for Accreting Stars*  
Matt, S., & Pudritz, R. E. 2008, **ApJ**, in preparation
- *New Limits on Coronal Winds from T Tauri Stars*  
Matt, S., Pudritz, R. E., Stassun, K. 2008, **ApJ**, in preparation

### ***Invited Conference Proceedings:***

- *Understanding the Spins of Young Stars* (invited review)  
Matt, S. & Pudritz, R. E., 2007, to appear in proceedings of the **14<sup>th</sup> Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun**, in press, astro-ph/0701648
- *The Spin History of Protostars: Disk Locking, Revisited*  
Matt, S. & Pudritz, R. E., 2004, in **Gravitational Collapse: from Massive Stars to Planets**, Rev. Mex. A. A. S. C., eds G. Garcia-Segura, G. Tenorio-Tagle, J. Franco, & H. Yorke, 22, 69
- *The Last Hurrah: PPN Formation by a Magnetic Explosion*  
Matt, S., Frank, A., & Blackman, E. 2004, in **Asymmetric Planetary Nebulae III**, ASP Conference Series, Vol. 313, Eds M. Meixner, J. Kastner, B. Balick, N. Soker, p. 449

### ***Contributed Conference Proceedings:***

- *The Nature of Stellar Winds in the Star-Disk Interaction*  
Matt, S. & Pudritz, R. E., 2007, to appear in proceedings of IAU Symposium No. 243, **Star-Disk Interaction in Young Stars**, in press, arXiv:0707.306
- *Measuring the Physical Conditions of Accreting Gas in T Tauri Systems*  
Bary, J. S. & Matt, S. 2007, to appear in proceedings of IAU Symposium No. 243, **Star-Disk Interaction in Young Stars**, in press
- *Collimation of a Central Wind by a Disk-Associated Magnetic Field*  
Matt, S., Winglee, R., & Böhm, K.-H. 2003, in **Jets in Young Stellar Objects: Theory and Observations in YSO's**, Eds A.J.L. Fernandes, P.J.V. Garcia, J.J.G. Lima, Kluwer, p. 65
- *Magnetic Formation of the Lobes and Equatorial Disk around Eta Carinae?*  
Balick, B. & Matt, S. 2001, in **Eta Carinae and Other Mysterious Stars: The Hidden Opportunities of Emission Spectroscopy**, ASP Conference Series, Vol. 242. Eds T. R. Gull, S. Johansson, K. Davidson, p.155
- *Spectroscopic Insight and the Physics of Circumstellar Matter: Josef Solf's Contribution to Astrophysics*, Böhm, K.-H., & Matt, S. 1999, in **Optical and Infrared Spectroscopy of Circumstellar Matter**, ASP Conference Series, Vol. 188., Eds Eike Guenther, Bringfried Stecklum, and Sylvio Klose, p. 11

### ***Abstracts/Posters:***

- *New Calculations of Magnetic Braking for Sun-Like Stars*  
Matt, S. 2007, **AAS Meeting 211**, #080.02
- *The Spin of Accreting Stars and Accretion-Powered Stellar Winds*  
Matt, S. & Pudritz, R. E. 2006, **AAS Meeting 209**, #219.09
- *Statistical Analysis of the Relationship Between Rotation, Disks, and X-rays Among Low-Mass Pre-Main-Sequence Stars*  
Stassun, K., Ardila, D., Matt, S., & Feigelson, E. 2006, **AAS Meeting 209**, #219.06
- *Spin of Accreting Stars: Accretion Powered Stellar Winds vs. Disk Locking*  
Matt, S. & Pudritz, R. E. 2005, **PPV Conference**, #8019
- *Quadrupolar Outflow: A Single-Wind Model for the eta Carinae Nebula*  
Matt, S., Balick, B. 2002, **AAS Meeting 201**, #49.06
- *Launch, Accrete, Repeat: Investigation of Disk Oscillations in an Episodic YSO Jet Formation Model*  
Matt, S., Goodson, A., Winglee, R., & Böhm, K.-H. 2001, **AAS Meeting 199**, #156.05
- *Old Faithful: Simulation-Based Investigation of an Episodic Jet Formation Model*  
Matt, S., Goodson, A., Winglee, R., & Böhm, K.-H. 2001, **AAS Meeting 198**, #48.10
- *Bipolarity Without Binarity: AGB Winds, Dipole Magnetic Fields, and Disk Formation*  
Matt, S., Balick, B., Winglee, R., & Goodson, A. 2000, **AAS Meeting 196**, #43.01