Benjamin M. Tofflemire

Contact Information

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Research Interests

T Tauri stars, formation and evolution of binary stars, accretion diagnostics, magnetic reconnection events, structure and evolution of protoplanetary disks, time-domain astrophysics

Education

Ph.D. Candidate Astronomy — **August 2011 - present**
University of Wisconsin-Madison — Madison, WI, USA
- Advisor: Professor Robert D. Mathieu
- Thesis: *Accretion Dynamics in Pre-Main Sequence Binary Stars*
- Expected Graduation: Spring 2018

B.S. Astronomy & Physics — **June 2011**
University of Washington — Seattle, WA, USA

Research Experience

Graduate Research Assistant — University of Wisconsin-Madison
Advisor: Prof. Robert D. Mathieu — **June 2012 - present**
- Measured the accretion rate for a sample of 9 pre-main sequence binaries as a function of orbital phase to test numerical models of binary accretion
- Characterized the kinematics and spatial distribution of accretion streams feeding young binary star systems with time-series, high-resolution spectroscopy from the SALT telescope
- Determined membership and binary population of evolved stars in the open cluster NGC 6791, as part of the WIYN Open Cluster Study, through multi-epoch, radial-velocity measurements

Advisor: Dr. Marina Orio — **August 2011 - December 2013**
- Modeled *Chandra* and *XMM-Newton* X-ray grating spectra of recurrent novae to determine white dwarf photospheric temperatures and the physical characteristics of ejected material

NSF Research Experiences for Undergraduates — University of Wisconsin-Madison
Advisor Prof. Alex Lazarian — **June 2010 - January 2011**
- Analyzed MHD simulations of ISM turbulence in search of statistical relationships between observable quantities (column density distributions) and magnetic field strength

Undergraduate Research Assistant — University of Washington
Advisor: Prof. Suzanne Hawley and Prof. John Wisniewski — **September 2009 - Nov 2011**
- Characterized the near-infrared variability of magnetic reconnection events on M dwarfs

Awards

University of Wisconsin Jansky Award for Outstanding Research		**2017**
UW-Madison Graduate School Conference Presentation Award	($2,400)	**2015, 2016, 2017**
Sigma Xi Grants in Aid of Research	($2,500)	**2015**
University of Wisconsin Bautz Travel Fellowship	($1200)	**2015**
University of Wisconsin Vilas Research Travel Grant	($600)	**2015**
AAS 225 Chambliss Student Prize Honorable Mention		**2015**
University of Wisconsin – University Housing Honored Instructor		**2012**
University of Washington's Astronomy Bear Prize Recipient		**2011**
University of Washington Mary Gates Research Scholarship	($4,000)	**2010, 2011**

Observing Experience

Southern African Large Telescope
- **PI:** Time-Series Spectroscopy of Pre-Main Sequence Binaries (42.5 hrs of P0/P1)

WIYN 3.5-m Telescope
- **PI:** Radial velocity survey of accreting stars in NGC 2264 (2 nights)
- **PI:** Time-series spectroscopy of flare stars in Pleiades star cluster (3 nights)
- Co-I: WIYN Open Cluster Study radial-velocity survey ($\sim$ 90 nights over 8 semesters)

Las Cumbres Observatories Global Telescope Network
- Co-I: Time-series photometry of Pre-Main Sequence Binaries (980 hours over 5 semesters)

SMARTS 1.3m
- **PI:** Time-series photometry of Pre-Main Sequence Binaries (107 hours over 4 semesters)
- **PI:** Time-series spectroscopy of Pre-Main Sequence Binary V4046 Sgr (42 hours)

WIYN 0.9-m Telescope
- **PI:** High Cadence Photometry of Pre-Main Sequence Binary DQ Tau (16 nights)

APO: ARCSAT 0.5m
- **PI:** High Cadence Photometry of Pre-Main Sequence Binary DQ Tau (16 nights)

KPNO: 2.1m
- Co-I: High Cadence, NIR Photometry of M Dwarf Flare Stars (5 nights)

Talks

AAS 231 — **January 2018**
Dissertation Talk — National Harbor, MD

Vanderbilt University — **November 2017**
Astrophysics Lunch — Nashville, TN

Institute for Theory and Computation (Harvard-CfA) — **March 2017**
Stars and Planets Seminar (Invited) — Cambridge, MA

American Museum of Natural History — **March 2017**
Astronomy Seminar — New York, NY

Space Telescope Science Institute — **March 2017**
Exoplanets, Star and Planet Formation Seminar — Baltimore, MD

University of Texas-Austin — **October 2016**
Stars Seminar (Invited) — Austin, TX

Cool Stars 19 — **June 2016**
Contributed Talk — Uppsala, Sweden

Science with SALT — **June 2015**
Contributed Talk — Stellenbosch, South Africa

X-ray Binaries - 50 Years Since the Discovery of Sco X-1 — **July 2012**
Contributed Talk — Chandra X-ray Center, Boston, MA

Service

UW-Madison Astronomy Graduate Admissions Committee (Elected)	**2015 - 2016**
NASA ROSES Review Panel Secretary	**2015**
Graduate Student-Faculty Liaison (Elected)	**2014 - 2015**
Undergraduate Liaison to the Univ. of Washington Astronomy Department	**2010 - 2011**
Stars Coffee Curator (weekly department meeting)	**2013 - present**

Mentoring Experience

DELTA (CIRTL) Mentor Training Seminar — **Summer 2014**
Class focused on establishing realistic expectations, considering the issues of human diversity, and developing a reflective approach to mentoring

UW-Madison Undergrad Research — **June 2015 - June 2017**
Graduate Student Mentor — University of Wisconsin-Madison
- Advised Nathan Eggen (currently a University of Minnesota graduate student) on project to produce and model the lightcurves of Pre-Main Sequence binary stars

NSF REU — **June - August 2014**
Graduate Student Mentor — University of Wisconsin-Madison
- Co-advised Sarah Kessler (currently an Ohio State graduate student) and Francis Klein on a project searching for triple companions to spectroscopic binaries in open cluster M67 using *HST*

EAGLE School Science Mentor **Spring 2015**
Science Mentor Madison, WI
- Held weekly meetings with junior-high student Josh DuBeau to create a class presentation on stellar evolution and exoplanet detection

Teaching Experience

Course Development & Teaching **Fall 2017, Spring 2018**
Astronomy 140: The Exoplanet Revolution University of Wisconsin-Madison
- Co-developing curriculum and labs for an intro-level class on exoplanets with Prof. Mathieu
- Co-teaching first implementation of course with Prof. Mathieu in Spring 2018

Teaching Assistant **Fall 2012, Fall 2015**
Astronomy 103: The Evolving Universe University of Wisconsin-Madison
- Taught six discussion sections per week, which included developing lesson plans and in-class activities

Outreach

Universe in the Park **2011-present**
- Visit Wisconsin state parks to host public observing and astronomy presentations (>15 events hosted)

Washburn Public Observing Nights **2011-present**
- Host public and private observing nights at the historic Washburn observatory (>15 events hosted)

Girls Inc. Planetarium Shows **2014**
- Presented planetarium shows to Madison's local chapter of Girls Inc.

Space Place **November 2016**
- Invited lecture to amateur astronomy community (televised) Madison, WI

Senior Summer School **July 2014**
- Invited lecture to the Senior Summer School educational, vacation program Chicago, IL

Technical Skills

Programming Languages
- Experienced: python, IDL, HTML
- Basic Knowledge: Fortran, SQL

Tools
- LaTeX, IRAF, DS9, Source Extractor, Git, Jekyll (web development)

Peer-Reviewed Publications

First Author Publications

6. **Tofflemire**, B. M., Mathieu, R. D., Herczeg, G. J., Akeson, R. L., & Ciardi, D. R. 2017b, ApJL, 842, L12 – *Pulsed Accretion in the T Tauri Binary TWA 3A*

5. **Tofflemire**, B. M., Mathieu, R. D., Ardila, D. R., Akeson, R. L., Ciardi, D. R., Johns-Krull, C., Herczeg, G. J., & Quijano-Vodniza, A. 2017a, ApJ, 835, 8 – *Accretion and Magnetic Reconnection in the Classical T Tauri Binary DQ Tau*

4. **Tofflemire**, B. M., Gosnell, N. M., Mathieu, R. D., & Platais, I. 2014, AJ, 148, 61 – *WIYN Open Cluster Study. LIX. Radial Velocity Membership of the Evolved Population of the Old Open Cluster NGC 6791*

3. **Tofflemire**, B. M., Orio, M., Page, K. L., Osborne, J. P., Ciroi, S., Cracco, V., Di Mille, F., & Maxwell, M. 2013, ApJ, 779, 22 – *X-Ray Grating Observations of Recurrent Nova T Pyxidis during the 2011 Outburst*

2. **Tofflemire**, B. M., Wisniewski, J. P., Kowalski, A. F., Schmidt, S. J., Kundurthy, P., Hilton, E. J., Holtzman, J. A., & Hawley, S. L. 2012, AJ, 143, 12 – *The Implications of M Dwarf Flares on the Detection and Characterization of Exoplanets at Infrared Wavelengths*

1. **Tofflemire**, B. M., Burkhart, B., & Lazarian, A. 2011, ApJ, 736, 60 – *Interstellar Sonic and Alfvénic Mach Numbers and the Tsallis Distribution*

Co-Author Publications

13. Zemko, P., Ciroi, S., Orio, M., et al. (including **Tofflemire**, B. and 8 co-authors) 2018, submitted – *Optical Observations of Novae in Quiescence*

12. Peretz, U., Orio, M., Behar, E., Bianchini, A., Gallagher, J., Rauch, T., **Tofflemire**, B., & Zemko, P., 2016, ApJ 829, 2 829, 2 – *Chemical and Physical Parameters from X-Ray High-resolution Spectra of the Galactic Nova V959 Mon*

11. Milliman, K., Leiner, E., Mathieu, R., **Tofflemire**, B., & Platais, I. 2016, AJ, 151, 152 – *WIYN Open Cluster Study. LXXI. Spectroscopic Membership and Orbits of NGC 6791 Sub-Subgiants*

10. Mack, C., III, Ge, J., Deshpande, R., et al. (including **Tofflemire**, B. and 41 co-authors) 2013, AJ, 145, 139 – *A Cautionary Tale: MARVELS Brown Dwarf Candidate Reveals Itself to be a Very Long Period, Highly Eccentric Spectroscopic Stellar Binary*

9. Orio, M., Behar, E., Gallagher, J., Bianchini, A., Chiosi, E., Luna, G., Nelson, T., Rauch, T., Schaefer, B., & **Tofflemire**, B., 2013, MNRAS, 429, 1342 – *Thomson scattering and collisional ionization in the X-ray grating spectra of the recurrent nova U Scorpii*

8. Fleming, S. W., Ge, J., Barnes, R., et al. (including **Tofflemire**, B. and 58 co-authors) 2012, AJ, 144, 72 – *Very Low Mass Stellar and Substellar Companions to Solar-like Stars from MARVELS. II. A Short-period Companion Orbiting an F Star with Evidence of a Stellar Tertiary and Significant Mutual Inclination*

7. Wisniewski, J. P., Ge, J., Crepp, J. R., et al. (including **Tofflemire**, B. and 41 co-authors) 2012, AJ, 143, 107 – *Very Low Mass Stellar and Substellar Companions to Solar-like Stars from MARVELS. I. A Low-mass Ratio Stellar Companion to TYC 4110-01037-1 in a 79 Day Orbit*

6. Sayres, C., Subasavage, J. P., Bergeron, P., Dufour, P., Davenport, J., AlSayyad, Y., & **Tofflemire**, B., 2012, AJ, 143, 103 – *A Multi-survey Approach to White Dwarf Discovery*

5. Schmidt, S., Kowalski, A., Hawley, S., Hilton, E., Wisniewski, J., & **Tofflemire**, B., 2012, ApJ, 745, 14 – *Probing the Flare Atmospheres of M Dwarfs Using Infrared Emission Lines*

4. Hornbeck, J., Grady, C., Perrin, M., Wisniewski, J., **Tofflemire**, B., et al. (11 co-authors) 2012, ApJ, 744, 54 – *PDS 144: The First Confirmed Herbig Ae-Herbig Ae Wide Binary*

3. Eisenstein, D. J., Weinberg, D. H., Agol, E., et al. (including **Tofflemire**, B. and 252 co-authors) 2011, AJ, 142, 72 – *SDSS-III: Massive Spectroscopic Surveys of the Distant Universe, the Milky Way, and Extra-Solar Planetary Systems*

2. Aihara, H., Allende Prieto, C., An, D., et al. (including **Tofflemire**, B. and 176 co-authors) 2011, ApJS, 193, 29 – *The Eighth Data Release of the Sloan Digital Sky Survey: First Data from SDSS-III*

1. Janson, M., Carson, J., Thalmann, C., et al. (including **Tofflemire**, B. and 44 co-authors) 2011, ApJ, 728, 85 – *Near-infrared Multi-band Photometry of the Substellar Companion GJ 758 B*

Other Publications

Conference Proceedings

4. **Tofflemire**, B., Mathieu, R., Herczeg, G., et al. 2017, Francesco's Legacy: Star Formation in Space and Time, Memorie della Società Astromonica Italiana, Vol 88 n. 4, 820 – *Accretion Dynamics in Pre-main Sequence Binaries*

3. **Tofflemire**, B., 2015, SALT Science Conference 2015 (SSC2015), 26 – *Accretion Dynamics in Pre-Main Sequence Binaries*

2. **Tofflemire**, B., 2012, X-ray Binaries. Celebrating 50 Years Since the Discovery of Sco X-1, 57 – *X-ray Grating Observations of Recurrent Nova T Pyx*

1. **Tofflemire**, B., Wisniewski, J., Hilton, E., et al. 2011, 16th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, 448, 1287 – *M Dwarf Flares: Exoplanet Detection Implications*

Conference Abstracts

6. **Tofflemire**, B., Mathieu, R., Herczeg, G., et al. 2018, American Astronomical Society Meeting Abstracts, 231, 414.05 – *An Observational Study of Accretion Dynamics in Short-Period Pre-Main Sequence Binaries*

5. **Tofflemire**, B., Mathieu, R., Ardila, D., et al. 2016, American Astronomical Society Meeting Abstracts, 227, 236.06 – *Accretion and Magnetic Reconnection in the Pre-Main Sequence Binary DQ Tau as Revealed through High-Cadence Optical Photometry*

4. **Tofflemire**, B., Mathieu, R., Ardila, D., & Ciardi, D. 2015, American Astronomical Society Meeting Abstracts, 225, 348.11 – *Time-series Photometry of the Pre-Main Sequence Binary V4046 Sgr: Testing the Accretion Stream Theory*

3. **Tofflemire**, B., Gosnell, N., & Mathieu, R., 2013, American Astronomical Society Meeting Abstracts, 222, 214.04 – *WIYN Open Cluster Study: Radial Velocity Membership of the Evolved Population of Open Cluster NGC 6791*

2. **Tofflemire**, B., Lazarian, A., & Burkhart, B., 2011, Bulletin of the American Astronomical Society, 43, 251.02 – *Analysis of MHD Interstellar Turbulence using Tsallis Statistics*

1. **Tofflemire**, B., Wisniewski, J., Kowalski, A., et al. 2010, Bulletin of the American Astronomical Society, 42, 423.15 – *M Dwarf Flares: Exoplanet Implications*

Astronomer's Telegram

2. Orio, M., **Tofflemire**, B., & Truran, J. 2012, The Astronomer's Telegram, 4092 – *Chandra X-ray grating observation of Nova LMC 2012*

1. **Tofflemire**, B., Orio, M., Kuulkers, E., et al. 2011, The Astronomer's Telegram, 3762 – *A Chandra grating observation of T Pyxidis*

CARMA Memo

1. Wright, M., Pound, M., Plambeck, R., et al. (including **Tofflemire**, B.), 2011, CARMA Summer School 2011, CARMA Memoranda Index #56

References

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