

Jonathan Foster

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EDUCATION

Harvard University:

Candidate for Ph.D. in Astronomy, Expected May 2009

Masters in Astronomy, June 2005

California Institute of Technology:

B.S. in Astronomy with honors, June 2003

RESEARCH POSITIONS

Department of Astronomy, Harvard University

Ph.D. Candidate, 2003 - present

- Used Analysis of Variance to firmly establish statistical properties and distinctions between cores with/without protostars and inside/outside clusters.
- Developed GNICER algorithm to include background galaxies into extinction maps in an unbiased way.
- Pioneered the use of "Cloudshine" (illumination of dark cores by the interstellar radiation field) in measuring the density structure of cores at arcsecond resolution.
- Contributed to many additional projects within the COMPLETE Survey (see publications and observing experience).

Awarded support by NASA Astrophysics Data Program and GBT Student Support Program.

Department of Astronomy, California Institute of Technology

Research Assistant, 2001 - 2002

- Calibrated new 1.03 micron filter (Y band)
- Reduced and calibrated echelle spectroscopy of young stars

Programmer and Lab Assistant, Summer 2001.

- Developed web-based interface for SHARCII (Submillimeter High Angular Resolution Camera IInd Generation) and assisted in fabrication of the instrument.

Department of Astronomy, Cornell University

Research Experience for Undergraduates (REU) Award, Summer 2002

- Designed martIR (Multipurpose Analysis and Reduction Tool for the InfraRed)
- Conducted multi-wavelength investigation of microquasar GRS 1915+105 during July '01 outburst event

TEACHING

Science A-47, Cosmic Connections

Fall 2004, 2005, 2006: Teaching Fellow.

Weekly section lecture and problem-set grading for 15-student section.

Fall 2005, 2006: Head TF

Coordination of 15 TFs and ~ 300 students. Helped set course procedures and policy.

QR 46, Visual Display of Quantitative Information

Spring 2005: Teaching Fellow

Weekly section and grading for 7-student section

PUBLICATIONS

- **Foster, J.B.**, Rosolowsky, E., Kauffman, J., Pineda, J., Borkin, M., Caselli, P., Myers, P., Goodman, A., Dense Cores in Perseus: The Influence of Stellar Content and Cluster Environment, Accepted to ApJ.
- **Foster, J.B.**, Román-Zúñiga, C., Goodman, A.A., Lada, E., Alves, J. Hunting Galaxies to (and for) Extinction, ApJ, 2008, 674, 831.
- **Foster, J.B.**, & Goodman, A.A., 2006, Cloudshine: New Light on Dark Clouds, ApJ, 636,L105
CfA Press Release: "Cosmic Cloudshine: Its Beauty Is More Than Skin Deep."
<http://cfa-www.harvard.edu/press/pr0534.html>
Calar Alto Press Release: "The Dark Also Shines."
<http://www.caha.es/the-dark-also-shines.html>
Nature News: "Snapshot: cloudshine is a stellar snap for Harvard duo." *Nature*.
2006 Jan 19;439(7074):250.
- Goodman, A.A., Rosolowsky, E.W., Borkin, M.A., **Foster, J.B.**, Halle, M., Kauffmann, J., Pineda, J.E., A Role for Self-gravity at Multiple Length Scales in the Process of Star Formation, *Nature*, 2009, 457, 63-66
- Schnee, S., Rosolowsky, E., **Foster, J.B.**, Enoch, M., Sargent, A., The Gas Temperature of Starless Cores in Perseus, Accepted to ApJ.
- Rosolowsky, E. W., Pineda, J. E., **Foster, J. B.**, Borkin, M. A., Kauffmann, J., Caselli, P., Myers, P. C., Goodman, A. A., An Ammonia Spectral Atlas of Dense Cores in Perseus, ApJS, 2008, 175, 509
- Ridge, N.A., Schnee, S.L., Goodman, A.A., & **Foster, J.B.**, 2006, The COMPLETE Nature of the Warm Dust Ring in Perseus, ApJ, 643, 932.
- Ridge, N.A., & **The COMPLETE Team**, 2006, The COMPLETE Survey of Star Forming Regions: Phase 1 Data, AJ, 131, 2921.

- Mochejska B.J., Stanek K.Z., Sasselov D.D., Szentgyorgyi A.H., Adams E., Cooper R.L., **Foster J.B.**, Hartman J.D., Hickox R.C., Lai K., Westover M., Winn J.N., 2006, Planets in Stellar Clusters Extensive Search. IV. A Detection of a Possible Transiting Planet Candidate in the Open Cluster NGC 2158, *AJ*, 131, 1090-1105
- Blazejowski M. and **Team**, 2005, A Multiwavelength View of the TeV Blazar Markarian 421: Correlated Variability, Flaring, and Spectral Evolution, *ApJ*, 630, 130-141
- Hillenbrand L.A., **Foster J.B.**, Persson S.E., & Matthews K., 2002, The Y Band at 1.035 Microns: Photometric Calibration and the Dwarf Stellar/Substellar Color Sequence, *PASP*, 114, 708

TALKS

- Foster, J.B., Goodman, A.A., Caselli, P., Pineda, J., "Using Cloudshine to Constrain Turbulent Star Formation", AAS Meeting, Seattle, WA, Jan 2007
- Foster, J.B., "Far from the Galactic Plane: Adventures in Extinction Mapping", Princeton ISM Seminar, Princeton, NJ, Dec 2006
- Foster, J.B., "Cloudshine: The end of extinction mapping & the start of a new view of dark clouds", Universidad de Santiago Astronomy Talk, Santiago, Chile, June 2005
- Foster, J.B., "Catching Speeding Young Stars", Harvard-Smithsonian CfA Star and Planet Formation Internal Symposium, Cambridge, MA, Sep 2004

POSTERS

- Foster, J.B., Goodman, A.A., Pineda, J., Covey, K., Alves, J., "The Scattering and Extinction Properties of Dust in the Perseus Molecular Cloud," Cosmic Dust Near and Far, Heidelberg Germany, Sept 2008
- Foster, J.B., Goodman, A.A., "Cloudshine: A Limit of Extinction Mapping and the Beginning of a New View of Dark Clouds.", Protostars and Planets V, Kona, HI, Oct 2005
- Foster, J.B., Goodman, A.A., Borkin, M., "Measuring the Velocities of Young Stars in Ophiuchus", AAS Meeting, San Diego, CA, Jan 2004

CONFERENCE AFFILIATE

- Student Affiliate at "Star Formation: Then and Now" Kavli Institute for Theoretical Physics (KITP) at UC Santa Barbara August 6th - 27th.

PROFESSIONAL AND COMMITTEE ACTIVITIES

- 2003 - present: Principally responsible for maintaining the particularly the data archival/ access and publications portions of the COMPLETE group website (<http://www.cfa.harvard.edu/COMPLETE/>).
- Developed and deployed Google-sky based data coverage tool: <http://www.cfa.harvard.edu/COMPLETE/data/CoverageTool/CoverageTool.html>

- Developed an interactive tool to access the GBT pointed Ammonia spectra survey: http://www.cfa.harvard.edu/COMPLETE/data_html_pages/GBT_NH3.html
- Arranged and published the work of Alyssa Goodman and the COMPLETE team's "Ten Step Program for Star and Planet Formation" public education effort: http://www.cfa.harvard.edu/COMPLETE/learn/star_and_planet_formation.html
- 2005 - 2008: Student Representative on the Committee for Academic Standards. The purpose of the committee is to insure that students receive adequate guidance at the pre-thesis level, to see that uniform academic standards are applied, and to define the professional qualifications for advanced degrees in astronomy.
- 2005 - 2006: Student Representative on the Center for Astrophysics (CfA) Web Redesign Working Group. Worked with team of scientists and computer-support staff to define the requirements and develop the structure of the new CfA website: <http://www.cfa.harvard.edu/>
- 2004 - 2007: Student A/V Assistant. Assisted visiting colloquium speakers with technical matters and operated A/V equipment during colloquium.

OBSERVATIONAL PROJECTS/EXPERIENCE

- 7 nights (Feb 7 - 13, 2004) using 4shooter on the 1.2 meter at Mount Hopkins. Visual (V and R band) photometry for the PISCES planet search project (PI B. Mochejska), as well as service observing of blazars and lensed galaxies
- 3 nights (March 19 - 21, 2004) observing at the GBT. HI self-absorption mapping of Perseus. PI D. Li in collaboration with the COMPLETE team.
- 4 nights (Jan 1 - 4, 2005) using OMEGA 2000 on the 3.5 meter at Calar Alto. Near-IR (J, H, and Ks) deep observations of dark clouds in Perseus for extinction mapping. I was the principal author of the proposal, and planned and carried out the observations. (PI, M. Tafalla)
- 5 nights (March 9 - 13, 2004) using FAST spectrascope on the 1.5 meter at Mount Hopkins. Visual spectroscopy of various projects (PMS stars, 2MASS redshifts, Halo stars, AGN, Symbiotic Stars, SNaE). Obtained the spectra which classified SN 2005ar as a type-Ib (IAU Circular No. 8493)
- 3 nights and 1 day (March 27 and April 1-3) remote observing using SEQUOIA at FCRAO. On-the-fly mapping of Perseus molecular clouds in the J=1-0 12-CO line
- 4 nights (Jun 23 - 26, 2005) with ISPI on the 4 meter Blanco at CTIO. Near-IR (J, H, and Ks) deep observations of dark clouds in Ophiuchus for extinction mapping. I was the principal author of the proposal, and planned and led the observations. (PI, N. Ridge)

- 5 nights (Jun 8 - 12, 2006) with ISPI on the 4 meter Blanco at CTIO. Near-IR (J, H, and Ks) deep observations of dark clouds in Ophiuchus for extinction mapping. I was the principal author of the proposal, and planned and led the observations. (PI, N. Ridge)
- 4 half-nights (Oct - Nov, 2006) remote observing ammonia and CCS at the GBT. PI E. Rosolowsky.
- 3 nights (Nov 2006) observations of CO lines with SMA interferometer to constrain the outflow and velocity information in the L1448 cloud. I was the PI on the project. Observations were carried out in service mode by the operator.
- 3 nights and 5 half nights (Sept 23 - Oct 2 2007) observing at CSO. Successful projects: N₂H⁺ (3-2) mapping of cores in Serpens, Perseus (L1448) and Taurus (TMC-1c), Bolocam 2-mm mapping of TMC-1c. Bad weather prevented using SHARC II at 350 microns to map TMC-1c. PI S. Schnee.
- 2 half-nights (Nov 2,3 2007) at MMT using Megacam to make r,i,z images of two large 1 degree fields in Perseus for extinction study. (J. Pineda was the observer. I was PI on the proposal and principally responsible for designing observing strategy.)
- 1.5 days (March 2008) at GBT mapping NH₃ and CCS on project led by PI J. Pineda.
- 5 partial nights (March 18, 21, 24, 25, 30, 2008) using Omega 2000 at 3.5 meter at Calar Alto to observe cloudshine in B19 core. Remote service observing through operator, I was PI though time was Director's Discretionary through J. Alves and designed the observing strategy.
- 3 nights of time spread over 4 nights (Nov 14-18, 2008) using Omega 2000 at 3.5 meter at Calar Alto to observe cloudshine in two candidate un-evolved cores (B4, D35) in Perseus. Remote service observing through operator. I was the PI on the observing proposal and designed the observing strategy.

COMPUTER Skills

- Programming Languages: C, C++, Java, Javascript, Perl, Python, IDL
- Markup Languages: HTML, LaTeX, XML
- Analysis Software: Mathematica, R, Igor Pro, IRAF (Image Reduction and Analysis Facility), Source Extractor, WCSTools, KARMA, DS9, CLASS
- Graphical: Photoshop, Illustrator, Google Earth
- Technical: Cluster compute experience with Sun Grid Engine (SGE) and Mac OS X Xgrid. Experience with installation and maintenance of MediaWiki software and MySQL backend. Experience with Subversion.