

# Mordecai-Mark Mac Low

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## Education

1979 Stuyvesant High School, NY  
1983 Princeton Univ.: A. B., Physics  
1985 Univ. of Colorado at Boulder: M.A., Physics  
1989 Ph.D., Physics

## Relevant Employment

2007 – Curator, Dept. of Astrophysics, Amer. Museum of Natural History  
2019 – Curator-in-Charge, Dept. of Astrophysics, AMNH  
2018 – 2021 Rsch. Sci., Center for Computational Astrophysics, Flatiron Inst.  
2007 – 2012 Chair, Division of Physical Sciences, AMNH  
2005 – 2012 Curator-in-Charge, Dept. of Astrophysics, AMNH  
2002 – 2007 Associate Curator, Dept. of Astrophysics, AMNH  
1999 – 2002 Assistant Curator, Dept. of Astrophysics, AMNH  
1995 – 1999 Scientist, Max-Planck-Institut für Astronomie  
1994 – 1995 Rsch. Assoc., Dept. of Astronomy, UIUC  
1992 – 1995 Rsch. Assoc., Dept. of Astron. & Astrophys., Univ. of Chicago  
1991 – 1992 Rsch. Assoc., Center for Star Formation Studies, UC Berkeley  
1989 – 1990 NRC Postdoctoral Fellow, NASA Ames Research Center  
1983 – 1988 Rsch. Asst., JILA, Univ. Colo. / NBS [NIST]  
Summer 1984 Programmer, Space Astronomy Laboratory, U. Wisc. Madison  
Summer 1982 Undergrad. Rsch. Fellow, Div. Geo. & Planetary Sci., Caltech

## Adjunct and Visiting Positions

2007 – Adjunct Professor, Dept. of Astronomy, Columbia Univ.  
2012 – Visiting Prof., Dept. of Physics, Drexel Univ.  
2015 – 2016 Visiting Prof., Inst. of Theor. Astrophys., ZAH, Univ. of Heidelberg  
2002 – 2007 Adj. Assoc. Professor, Dept. of Astronomy, Columbia Univ.  
1999 – 2002 Adj. Asst. Professor, Dept. of Astronomy, Columbia Univ.

## Fellowships & Honors

- Humboldt Research Prize, 2014
- National Research Council Fellowship, 1989-1990
- University of Colorado Graduate School Fellowship, 1983-1984, 1985-1986

## Major Institutional Service

### Exhibitions

- Co-curator (with G. Harlow), “Exploratorium/AMNH,” 2005.
- Co-curator (with D. Ebel), “Saturn: Images from the Cassini-Huygens Mission,” 2008.
- Lead Curator (with R. Oppenheimer), Space Show, “Journey to the Stars,” 2009.
- Curator, Hayden Big Bang Theater presentation, 2010.
- Curator, Rose Center for Earth and Space renovation, 2010.
- Curator, Space Show, “Dark Universe,” 2012.
- Curator, remake of Space Show “Passport to the Universe,” 2018
- Co-PI, Open Space visualization software grant from NASA SMD CAN, 2016, renewed 2021.

### Education

- initial PI of Museum Research Experiences for Undergraduates program, NSF funded, 2002–present
- Founding professor in Master of Arts in Teaching Earth Science Program, Richard Gilder Graduate School, teaching Space Systems 2012–present
- Institutional PI for AstroCom NYC research and education partnership with minority-serving CUNY campuses, funded by NSF, 2013, renewed 2018.

### Administration

- Co-chair, search committee, Physical Sciences (Astrophys.) curator, 2003
- Chair, Senate Technology Committee, 2003–2006
- Chair, Grants & Fellowships Committee, 2005–2007
- Co-chair, Staff Planning Subcommittee on The Digital Future, 2010–2011
- Member, Performance Review Committee, 2014-present
- Chair, Senate Education Committee, 2016–2018
- Co-chair (with D. Spergel, Center for Computational Astrophysics), search committee, Physical Sciences (Astrophys.) curator, 2017
- Chair, Senate of the Scientific Staff, 2022-2024

## Major Professional Service

- Member, Employment Committee, American Astronomical Society, 2001–2004.
- Chair, Interstellar Medium Grant Review Panel, Galactic Astronomy Program, National Science Foundation, 2000, 2004.
- Deputy Chair, Galactic Subcommittee III, Spitzer Space Telescope Time Allocation Committee, 2008.
- Chair, Scientific Organizing Committee, Meteorites, Planetesimals & Disks, AMNH workshop in conjunction with Meteoritical Soc. meeting, 2010.
- Chair, Galactic Astron. Panel, NASA Keck Telescope Time Allocation Comm., 2010–2011.
- Member, Deutsche Forschungsgesellschaft (DFG) review panel for Forschungsgruppe [Research Group] “Magnetisation of Interstellar and Intergalactic Media: The Prospects of Low-Frequency Radio Observations,” 2012.

- Member and Vice-Chair (2014), Congressionally-mandated Astronomy & Astrophysics Advisory Committee overseeing work by NSF, NASA, DOE, 2011–2014.
- Chair, Local Organizing Committee, Member, Scientific Organizing Committee, “Black Holes in Active Galactic Nucleus Disks,” Flatiron Institute, NY, 2019. [first ever meeting on this topic]
- Chair, Scientific and Local Organizing Committees, “Torch Open Source Workshop,” Flatiron Institute, NY, 2019.
- Chair, Subpanel, NASA mission review panel, 2022.

## Professional Associations

International Astronomical Union, American Astronomical Society, American Physical Society

## Fields of Interest

Star Formation, Planet Formation, Structure of the Interstellar Medium, Computational Gas Dynamics and Magnetohydrodynamics, Galactic Outflows, Black Hole Mergers

## Languages

English (native), German (B1/B2), French (A2), Spanish (A2)

## Teaching

2005 Interstellar Medium, Dept. of Astronomy, Columbia University

2011 – 2014, 2016, 2018, 2020 Space Systems, MA in Teaching, Gilder Graduate School, AMNH

2017 , 2022 AST GU 4260, Modeling the Universe, Dept. of Astronomy, Columbia University

## Advising

### Primary Doctoral Advisor

7. “A Meshless Method for Magnetohydrodynamics and Applications to Protoplanetary Disks,” C. P. McNally, 2012, Dept. of Astronomy, Columbia University, New York, NY, USA. Now engineer at General Fusion, Vancouver, BC, Canada.
6. “Planetesimal and Protoplanet Dynamics in a Turbulent Protoplanetary Disk,” C.-C. Yang, 2010, Dept. of Astronomy, University of Illinois at Urbana-Champaign, Champaign-Urbana, IL, USA. Now Asst. Prof., Dept. of Phys. & Astron. U. Alabama.
5. “Non-Ideal Magnetohydrodynamics in Star and Planet Formation,” J. S. Oishi, 2007, Dept. of Astronomy, University of Virginia, Charlottesville, VA, USA. Now Assoc. Prof., Dept. of Phys. & Astron., Bates College, Lewiston, ME
4. “Supernova-Driven Interstellar Turbulence,” M. K. R. Joung, 2006, Dept. of Astronomy, Columbia University, New York, NY, USA. Now CEO of Scapeflow, Inc., edtech startup gamifying high school mathematics curriculum.

3. “Star Formation Near and Far,” Yuexing Li, 2005, Dept. of Astronomy, Columbia University, New York, NY, USA. Now Assoc. Prof., Dept. of Astron. & Astrophys., Penn State U.
2. “Cosmological Feedback from Dwarf Starburst Galaxies,” A. Fujita, 2003, Dept. of Astronomy, Columbia University, New York, NY, USA. Now Assoc. Prof., Faculty of Engineering, Shinshu U., Japan.
1. “Hydrodynamic Interactions Between Massive Isolated Stars and the Interstellar Medium,” G. García-Segura, 1994, Departamento de Astrofísica, Universidad de La Laguna, Canary Islands, Spain. Now tenured scientist, Inst. of Astron., Enseñada, UNAM, Mexico.

## Doctoral Co-Advisor

7. “Stellar Feedback and Chemical Evolution in Dwarf Galaxies,” A. J. Emerick, 2019, Department of Astronomy, Columbia University, New York, NY, USA (with G. Bryan). Now Senior Data Scientist, car insurance, Metromile.
6. “The Formation and Early Evolution of Stellar Clusters,” J. E. Wall, 2019, Department of Physics, Drexel University, Philadelphia, PA, USA (with S. McMillan). Now Associate Fellow and Senior Staff AI Research Scientist at Lockheed Martin Space, Philadelphia.
5. “Formation and evolution of molecular clouds in a turbulent interstellar medium,” J. C. Ibáñez-Mejía, 2016, Department of Physics, University of Heidelberg, Heidelberg, Germany (with R. S. Klessen). Now Designer Engineer at ASML, microchip lithography, Eindhoven, Netherlands.
4. “Evolution of Star Clusters in Time-Variable Tidal Fields,” E. Mamikonyan, 2013, Department of Physics, Drexel University, Philadelphia, PA, USA (with S. McMillan). Now software developer at Susquehanna International Group, providing financial services, Philadelphia.
3. “Modeling Close Stellar Interactions Using Numerical and Analytical Techniques,” J.-C. Passy, 2012, Department of Physics and Astronomy, University of Victoria, Victoria, BC, Canada (with F. Herwig and O. De Marco). Now research engineer at MPI for Intelligent Systems, Tübingen, Germany.
2. “Effects of Ionizing Feedback in Massive Star Formation,” T. Peters, 2009, Department of Physics, Heidelberg University, Heidelberg, Germany (with R. S. Klessen). Now patent examiner at the German Patent and Trademark Office, Germany.
1. “Turbulence and fragmentation in molecular clouds,” F. Heitsch, 2001, Department of Physics, Heidelberg University, Heidelberg, Germany (with A. Burkert). Now Prof., Dept. of Physics & Astronomy, U. North Carolina at Chapel Hill.

## Postdoctoral Mentoring

11. A. Kuznetsova, 2020–
10. P. Marchand, 2019–2021. Now postdoctoral fellow, U. Toulouse III, Toulouse, France.
9. M. Richardson, 2017–2018. Now Education and Outreach Officer, McDonald Research Inst. of Particle Astrophys., Queens U., Kingston, ON, Canada
8. A. Hubbard, 2012–2017. Now quantitative engineer at Assess+RE, commercial real estate assessment firm, New York.
7. J. Grcevich, 2013–2016. Now Dir. of Outreach, Dept. of Astron., Columbia U.
6. W. Lyra, 2009–2011. Now Assoc. Prof., New Mexico State U.
5. J. Maron, 2004–2011. Now freelancer, incl. teaching online courses at AMNH.
4. H. Arce, 2004–2007. Now Prof., Dept. of Astron., Yale U.
3. S. C. O. Glover 2003–2006. Now Apl. Prof., Inst. of Theoret. Astrophys., Heidelberg U., Germany.
2. J. Ballesteros-Paredes, 1999–2000. Now tenured scientist at the Inst. of Radioastron. & Astrophys., UNAM, Mexico .
1. M. de Avillez, 1999–2000. Now tenured Asst. Prof., Dept. of Mathematics, U. Evora, Portugal.

## PhD Dissertation

“Interactions of Massive Stars with the Interstellar Medium: Bow Shocks and Superbubbles,” 1989, Dept. of Physics, University of Colorado at Boulder.

## Peer Reviewed Publications and Grants

### Refereed Papers

#### Submitted

2. “Fast methods to track grain coagulation and ionization. III. Protostellar collapse with non-ideal MHD,” Marchand, P., Lebreuilly, U., Mac Low, M.-M., Guillet, V. 2022, *Astron. Astrophys.*, submitted.
1. “Chondrule dynamics in current sheets in protoplanetary disks. I. Isothermal models with ambipolar diffusion and Ohmic resistivity,” Lebreuilly, U., Mac Low, M.-M., & Ebel, D. 2022, *Astron. Astrophys.*, under review.

#### In Press

1. “Fast methods to track grain coagulation and ionization. II. Extension to thermal ionization,” Marchand, P., Guillet, V., Lebreuilly, U., & Mac Low, M.-M. 2022, *Astron. Astrophys.*, in press.

#### Published

177. “Anisotropic Infall and Substructure formation in Embedded Disks,” Kuznetsova, A., Bae, J., Hartmann, L., & Mac Low, M.-M. 2022, *Astrophys. J.*, 928, 92 (17 pp).
176. “Gravity Versus Magnetic Fields in Forming Molecular Clouds,” Ibáñez-Mejía, J. C., Mac Low, M.-M., & Klessen, R. S. 2022, *Astrophys. J.*, 925, 196 (14 pp).
175. “Symmetry Breaking in Dynamical Encounters in the Disks of Active Galactic Nuclei,” Wang, Yi-Han, McKernan, B., Ford, K. E. S., Perna, R., Leigh, N., & Mac Low, M.-M. 2021, *Astrophys. J. (Letters)*, 923, L23 (6 pp).
174. “Simulations of the star-forming molecular gas in an interacting M51-like galaxy: cloud population statistics,” Treß, R. G., Smith, R. J., Sormani, M. C., Glover, S. C. O., Klessen, R. S., Mac Low, M.-M., Clark, P., Duarte-Cabral, A. 2021, *Monthly Not. Roy. Astron. Soc.*, 505, 5438–5459.
173. “SIGAME v3: Gas Fragmentation in Postprocessing of Cosmological Simulations for More Accurate Infrared Line Emission Modeling,” Olsen, K. P., Burkhart, B., Mac Low, M.-M., Treß, R. G., Greve, T. R., Vizgan, D., Motka, J., Borrow, J., Popping, G., Davé, R., Smith, R. J., Narayanan, D. 2021, *Astrophys. J.*, 922, 88 (21 pp).
172. “Fast Methods to track grain coagulation and ionization. I. Analytic derivation,” Marchand, P., Guillet, V., Lebreuilly, U., & Mac Low, M.-M. 2021, *Astron. Astrophys.*, 649, 50 (11 pp).

171. “Small-Scale Dynamo in Supernova-Driven Interstellar Turbulence,” Gent, F. A., Mac Low, M.-M., Käpylä, M. J., & Singh, N. K. 2021, *Astrophys. J. (Letters)*, 910, L15 (8 pp).
170. “Origin of Weak Mg II and Higher Ionization Absorption Lines in an Outflow from Intermediate-Redshift Dwarf Satellite Galaxies,” Fujita, A., Misawa, T., Charlton, J. C., Meiksin, A., & Mac Low, M.-M. 2021, *Astrophys. J.*, 909, 157 (21 pp).
169. “Implementing Primordial Binaries in Simulations of Star Cluster Formation with a Hybrid MHD and Direct N-Body Method,” Cournoyer-Cloutier, C., Tran, A., Lewis, S., Wall, J. E., Harris, W. E., Mac Low, M.-M., McMillan, S. L. W., Portegies Zwart, S., Sills, A. 2021, *Monthly Not. Roy. Astron. Soc.*, 501, 4464-4478.
168. “The Catalogue for Astrophysical Turbulence Simulations (CATS),” Burkhart, B., Appel, S. M., Bialy, S., Cho, J., Christensen, A. J., Collins, D., Federrath, C., Fielding, D., Li, M., Finkbeiner, D., Hill, A. S., Ibáñez-Mejía, J. C., Krumholz, M. R., Lazarian, A., Mac Low, M.-M., Mocz, P., Naiman, J., Shane, B., Slepian, Z., Yuan, Y., Portillo, S. K. N. 2020, *Astrophys. J.*, 905, 14 (15 pp).
167. “Modeling of the Effects of Stellar Feedback during Star Cluster Formation Using a Hybrid Gas and N-Body Method,” Wall, J. E., Mac Low, M.-M., McMillan, S. L. W., Klessen, R. S., Portegies Zwart, P., & Pellegrino, A. 2020, *Astrophys. J.*, 904, 192 (20 pp).
166. “Orbital Migration of Interacting Stellar Mass Black Holes in Disks around Supermassive Black Holes II. Spins and Incoming Objects,” Secunda, A., Bellovary, J., Mac Low, M.-M., Ford, K. E. S., McKernan, B., Leigh, N. W. C., Lyra, W., Sándor, Zs., & Adorno, J. I. 2020, *Astrophys. J.*, 903, 133 (15 pp).
165. “The Dynamics, Destruction, and Survival of Supernova-Formed Dust Grains,” Slavin, J. D., Dwek, E., Mac Low, M.-M., & Hill, A. S. 2020, *Astrophys. J.*, 902, 135 (12 pp).
164. “Time-Variable Radio Recombination Line Emission in W49A,” De Pree, C. G., Wilner, D. J., Kristensen, L. E., Galván-Madrid, R., Goss, W. M., Klessen, R. S., Mac Low, M.-M., Peters, T., Robinson, A., Sloman, S., & Rao, M. 2020, *Astron. J.*, 160, 234 (13 pp).
163. “Dynamical Properties of Molecular Cloud Complexes in Galaxies at the Epoch of Reionization,” Leung, T. K. D., Pallottini, A., Ferrara, A., & Mac Low, M.-M. 2020, *Astrophys. J.*, 895, 24 (16 pp).
162. “Simulating Metal Mixing of Both Common and Rare Enrichment Sources in a Low Mass Dwarf Galaxy,” Emerick, A., Bryan, G. L., & Mac Low, M.-M. 2020, *Astrophys. J.*, 890, 155 (17 pp).
161. “Simulations of the star-forming molecular gas in an interacting M51-like galaxy,” Treß, R. G., Smith, R. J., Sormani, M. C., Glover, S. C. O., Klessen, R. S., Mac Low, M.-M., & Clark, P. C. 2020, *Monthly Not. Roy. Astron. Soc.*, 492, 2973–2995

160. “Modelling supernova driven turbulence,” Gent, F. A., Mac Low, M.-M., Käpylä, M. J., Sarson, G. R., Hollins, J. F. 2020, *Geophys. Astrophys. Fluid Dyn.*, 114, 77–105.
159. “Collisional N-Body Dynamics Coupled to Self-Gravitating Magnetohydrodynamics Reveals Dynamical Binary Formation,” Wall, J. E., McMillan, S. L., Mac Low, M.-M., Klessen, R. S., & Portegies Zwart, S. 2019, *Astrophys. J.*, 887, 62 (12 pp).
158. “How do velocity structure functions trace gas dynamics in simulated molecular clouds?” Chira, R.-A., Ibáñez-Mejía, J. C., Mac Low, M.-M., & Henning, Th. 2019, *Astron. Astrophys.*, 630, A97 (21 pp).
157. “The Implications of Local Fluctuations in the Galactic Midplane for Dynamical Analysis in the *Gaia* Era,” Beane, A., Sanderson, R., Ness, M. K., Johnston, K. V., Filho, D. G., Mac Low, M.-M., Anglés-Alcázar, D., Hogg, D. W., & Laporte, C. F. P. 2019, *Astrophys. J.*, 883, 103 (17 pp.).
156. “Orbital Migration of Interacting Stellar Mass Black Holes in Disks around Supermassive Black Holes,” Secunda, A., Bellovary, J., Mac Low, M.-M., Ford, K. E. S., McKernan, B., Leigh, N., Lyra, W. 2019, *Astrophys. J.*, 878, 85 (18 pp).
155. “Simulating an Isolated Dwarf Galaxy with Energetic Feedback and Chemical Yields from Individual Stars,” Emerick, A., Bryan, G. L., & Mac Low, M.-M. 2019, *Monthly Not. Roy. Astron. Soc.*, 482, 1304–1329.
154. “Metal Mixing and Ejection in Dwarf Galaxies is Dependent on Nucleosynthetic Source,” Emerick, A., Bryan, G. L., Mac Low, M.-M., Côté, B., Johnston, K. V., & O’Shea, B. 2018, *Astrophys. J.*, 869, 64 (15 pp).
153. “Diffusion and Concentration of Solids in the Dead Zone of a Protoplanetary Disk,” Yang, C.-C., Mac Low, M.-M., & Johansen, A. 2018, *Astrophys. J.*, 868, 27 (19 pp).
152. “Stellar Radiation is Critical for Regulating Star Formation and Driving Outflows in Low Mass Dwarf Galaxies,” Emerick, A., Bryan, G. L., & Mac Low, M.-M. 2018, *Astrophys. J. (Letters)*, 865, L22 (7 pp).
151. “Constraining stellar-mass black hole mergers in AGN disks detectable with LIGO,” McKernan, B., Ford, K. E. S., Bellovary, J., Leigh, N. W. C., Haiman, Z., Kocsis, B., Lyra, W., Mac Low, M.-M., Metzger, B., O’Dowd, M., Endlich, S., & Rosen, D. J. 2018, *Astrophys. J.*, 866, 66 (7 pp).
150. “Flux Density Variations at 3.6 cm in the Massive Star-Forming Region W49A,” De Pree, C. G., Galván-Madrid, R., Goss, W. M., Klessen, R. S., Mac Low, M.-M., Peters, T., Wilner, D., Bates, J., Melo, T., Presler-Marshall, B., & Webb-Forgus, R. 2018, *Astrophys. J.*, 863, L9 (6 pp).
149. “Effect of the heating rate on the stability of the three-phase interstellar medium,” Hill, A. S., Mac Low, M.-M., Gatto, A., Ibáñez-Mejía, J. C., 2018, *Astrophys. J.*, 862, 55 (16 pp).



148. “Dust concentration and chondrule formation,” Hubbard, A., Mac Low, M.-M., & Ebel, D. S. 2018, *Meteorit. Plan. Sci.*, 53, 1507–1515.
147. “Cosmic Ray Driven Outflows in an Ultraluminous Galaxy,” Fujita, A., & Mac Low, M.-M. 2018, *Monthly Not. Roy. Astron. Soc.*, 477, 531–538.
146. “Spectral shifting strongly constrains molecular cloud disruption by radiation pressure on dust.” Reissl, S., Klessen, R. S., Mac Low, M.-M., & Pellegrini, E. W. 2018, *Astron. Astrophys.*, 611, 70 (19 pp).
145. “On the fragmentation of filaments in a molecular cloud simulation,” Chira, R. A., Kainulainen, J., Ibáñez-Mejía, J. C., Henning, Th., & Mac Low, M.-M. 2018, *Astron. Astrophys.*, 610, A62 (18 pp).
144. “On the rate of black hole mergers in galactic nuclei and active galactic nucleus disks due to dynamical hardening,” Leigh, N. W. C., Geller, A. M., McKernan, B., Ford, K. E. S., Mac Low, M.-M., Bellovary, J., Haiman, Z., Lyra, W., Samsing, J., O’Dowd, M., Kocsis, B., & Endlich, S. 2018, *Monthly Not. Roy. Astron. Soc.*, 474, 5672–5683.
143. “Feeding vs. Falling: The growth and collapse of molecular clouds in a turbulent interstellar medium.” Ibáñez-Mejía, J. C., Mac Low, M.-M., Klessen, R. S., & Baczynski, C. 2017, *Astrophys. J.*, 850, 62 (25 pp).
142. “On shocks driven by high-mass planets in radiatively inefficient disks. III. Observational signatures in thermal emission and scattered light.” Hord, B., Lyra, W., Flock, M., Turner, N. J., & Mac Low, M.-M. 2017, *Astrophys. J.*, 849, 2 (15 pp).
141. “Fast Molecular Cloud Destruction Requires Fast Cloud Formation.” Mac Low, M.-M., Burkert, A., & Ibáñez-Mejía, J. C. 2017, *Astrophys. J. (Letters)*, 847, 1 (5 pp).
140. “Evolution of Star Clusters in Time-Variable Tidal Fields,” Mamikonyan, E. N., McMillan, S. L. W., Vesperini, E., & Mac Low, M.-M. 2017, *Astrophys. J.*, 837, 70 (12 pp).
139. “Gas Loss by Ram Pressure Stripping and Internal Feedback From Low Mass Milky Way Satellites,” Emerick, A., Mac Low, M.-M., Grcevich, J., & Gatto, A. 2016, *Astrophys. J.*, 826, 148 (13 pp).
138. “Gravitational Contraction Versus Supernova Driving and the Origin of the Velocity Dispersion-size Relation in Molecular Clouds,” Ibáñez-Mejía, J. C., Mac Low, M.-M., Baczynski, C., & Klessen, R. S. 2016, *Astrophys. J.*, 824, 41 (15 pp).
137. “Migration Traps in Disks Around Supermassive Black Holes,” Bellovary, J. M., Mac Low, M.-M., McKernan, B., & Ford, K. E. S. 2016, *Astrophys. J.*, 819, L17 (5 pp).
136. “Launching Cosmic Ray-Driven Outflows From the Magnetized Interstellar Medium,” Girichidis, P., Naab, T., Walch, S., Hanasz, M., Mac Low, M.-M., Ostriker, J. P., Gatto, A., Peters, T., Wünsch, R., Glover, S. C. O., Klessen, R. S., Clark, P. C., & Baczynski, C. 2015, *Astrophys. J.*, 816, L19 (6 pp).

135. “On shocks driven by high-mass planets in radiatively inefficient disks. II. Three-dimensional global disk simulations.” Lyra, W., Richert, A. J. W., Boley, A., Turner, N., Mac Low, M.-M., Okuzumi, S., & Flock, M. 2016, *Astrophys. J.*, 817, 102 (9 pp).
134. “Hydrodynamic Simulations of the Interaction between an AGB Star and a Main Sequence Companion in Eccentric Orbits,” Staff, J., De Marco, O, Evans, D. M., Galaviz, P., Passy, J.-C., Iaconi, R. & Mac Low, M.-M. 2016, *Monthly Not. Roy. Astron. Soc.*, 455, 3511–3525.
133. “Evidence of Short Timescale Flux Density Variations of UC H II regions in Sgr B2 Main and North,” De Pree, C. G., Peters, T., Mac Low, M.-M., Wilner, D. J., Goss, W. M., Gálvan-Madrid, R., Keto, E. R., Klessen, R. S., & Monsrud, A. 2015, *Astrophys. J.*, 815, 123 (9 pp).
132. “Nearby Clumpy, Gas Rich, Star Forming Galaxies: Local Analogs of High Redshift Clumpy Galaxies,” Garland, C. A., Pisano, D. J., Mac Low, M.-M., Kreckel, K., Rabidoux, K., & Guzmán, R. 2015, *Astrophys. J.*, 807, 134 (8 pp).
131. “A three dimensional magnetohydrodynamic instability that drives fast magnetic reconnection,” Oishi, J. S., Mac Low, M.-M., Collins, D., & Tamura, M. 2015, *Astrophys. J. Lett.*, 806, L12 (5 pp).
130. “HST Images Flash Ionization of Old Ejecta by the 2011 Eruption of Recurrent Nova T Pyxidis,” Shara, M., Zurek, D., Schaefer, B., Bond, H., Godon, P. Mac Low, M.-M., Pagnotta, A., Prialnik, D., Sion, E., Toraskar, J., & Williams, R. 2015, *Astrophys. J.*, 805, 148 (8 pp).
129. “On shocks driven by high-mass planets in radiatively inefficient disks. I. Two-dimensional global disk simulations. ” Richert, A. J. W., Lyra, W., Mac Low, M.-M., & Turner, N. 2015, *Astrophys. J.*, 804, 95 (11 pp.).
128. “Growth of Asteroids, Planetary Embryos and Kuiper Belt Objects by Chondrule Accretion,” Johansen, A., Mac Low, M.-M., Lacerda, P., & Bizzarro, M. 2015, *Science Advances*, e1500109 (11 pp.).
127. “Modelling the supernova-driven ISM in different environments,” Gatto, A., Walch, S., Mac Low, M.-M., Naab, T., Girichidis, P., Glover, S. C. O., Wunsch, R., Clark, P. C., Baczynski, C., Peters, T., Klessen, R. S., Ostriker, J. P., Ibañez-Mejía, J. C., & Haid, S. 2015, *Monthly Not. Roy. Astron. Soc.*, 449: 1057-1075.
126. “The Origin of the Hot Gas in the Galactic Halo: Testing Galactic Fountain Models’ X-Ray Emission,” Henley, D. B., Shelton, R. L., Kwak, K., Hill, A. S., & Mac Low, M.-M. 2015, *Astrophys. J.*, 800, 102 (10 pp.).
125. “Temperature Fluctuations driven by Magnetorotational Instability in Protoplanetary Disks,” McNally, C., Hubbard, A., Yang, C.-C., & Mac Low, M.-M. 2014, *Astrophys. J.*, 791, 62 (15 pp.).

124. “Collective outflow from a small multiple stellar system,” Peters, T., Klaassen, P., Mac Low, M.-M., Schrön, M., Federrath, C., Smith, M. D., & Klessen, R. S. 2014, *Astrophys. J.*, 788, 14 (17 pp).
123. “Flickering of 1.3 cm Sources in Sgr B2: Towards a Solution to the Ultracompact H II Region Lifetime Problem,” De Pree, C. G., Peters, T., Mac Low, M.-M., Wilner, D. J., Goss W. M., Galván-Madrid, R., Keto, E. R., Heath, J., Monsrud, A., & Klessen, R. S. 2014, *Astrophys. J. (Letters)*, 781, L36 (4 pp).
122. “From Gas to Stars Over Cosmic Time,” Mac Low, M.-M. 2013, *Science*, 340, 1229229 (8 pp).
121. “The effect of feedback and reionization on star formation in low-mass dwarf galaxy haloes,” Simpson, C. M., Bryan, G. L., Johnston, K. V., Smith, B. D., Mac Low, M.-M., Sharma, S., & Tumlinson, J. 2013, *Monthly Not. Roy. Astron. Soc.*, 432, 1989–2011.
120. “Dynamical Fragmentation of the T Pyxidis Nova Shell During Recurrent Eruptions,” Toraskar, J., Mac Low, M.-M., Shara, M. M., & Zurek, D. R. 2013, *Astrophys. J.*, 768, 48 (11 pp).
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### **Also Noted**

1. “The Role of the Machine in the Experiment of Egoless Poetry: Jackson Mac Low and the Programmable Film Reader,” Mac Low, M.-M. 2012, in *Mainframe Experimentalism: Early Computing and the Foundations of the Digital Arts*, eds. H. B. Higgins & D. Kahn (Berkeley: U. California Press), 298–310 (refereed).

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Science PI is listed first in every case.

## Science

28. “Uncovering Planet Formation in Embedded Disks,” Kuznetsova, A., & Mac Low, M.-M. 2020, NASA Hubble Fellowship Program, \$138,486
27. “Collaborative Research: Globular Cluster Formation in Hierarchically Collapsing Clouds as an Origin for Multiple Stellar Populations,” Mac Low, M.-M., & McMillan, S. L. 2018, NSF Galactic Astronomy, \$417K (AMNH portion)
26. “The Injection, Transport and Evolution of Dust in Supernova-Driven Interstellar Media,” Slavin, J., Hill, A. S., & Mac Low, M.-M. 2017, NASA Astrophysical Theory Program, \$552,341
25. “Gaseous Infall and Star Formation From Redshift 2 to the Milky Way,” Hubble Space Telescope Theoretical Research,” Hill, A. S., Mac Low, M.-M. 2016, Hubble Space Telescope Theoretical Research, \$126 701
24. “High Temperature Mineral Formation by Short Circuits in Protoplanetary Disks,” Hubbard, A., Mac Low, M.-M. 2014, NASA Origins of Solar Systems, \$514 673
23. “Formation and Assembly of Massive Star Clusters,” McMillan, S., Mac Low, M.-M., Olson, K., Portegies-Zwart, S. 2014, NASA Astrophysics Theory Program, \$419 266
22. “Director’s Discretionary Time: Ionization and Light Echoes in the T Pyxidis Nebula,” Shara, M. M., Mac Low, M.-M., Toraskar, J., Zurek, D. 2012, NASA Space Telescope Science Institute, \$70 304
21. “Confronting Simulations of Dwarf Galaxy Formation with Observations of Resolved Stellar Populations,” Bryan, G., Johnston, K., & Mac Low, M.-M., 2012, NASA Astrophysical Theory Program, \$368 987
20. “What Controls Star Formation in Galaxies?,” Mac Low, M.-M., Joung, M. K. R., Klessen, R. S., Peters, T. 2011, NSF Galactic Astronomy, \$451 231
19. “Chandra Constraints on Feedback from Starburst Winds,” 2010, M.-M. Mac Low, C. Martin, NASA Chandra X-ray Center, \$121 003
18. “Layered accretion, vortex excitation, and planet formation in circumstellar disks,” Lyra, W., & Mac Low, M.-M. 2010, NSF Stellar Astronomy, \$460 911
17. “Simulating Star Formation in Space and Time,” Krumholz, M., Mac Low, M.-M., 2008, NASA Spitzer Science Center, AMNH share \$16 888
16. “Dynamical Evolution of Young Clusters in Merging Galaxies,” Vesperini, E., McMillan, S., Mac Low, M.-M. 2008, NASA Hubble Space Telescope, \$70 000

15. "Dwarf Galaxies, Abundance Distributions and the Physics of Galaxy Formation," Johnston, K., Bryan, G., Mac Low, M.-M. 2008, NSF Galactic Astronomy, subaward from Columbia U. AMNH share \$17 679
14. "CDI Type I: Combined Global Physical, Chemical, and Mineralogical Models of Protoplanetary Disks," Mac Low, M.-M., Maron, J., Ebel, D. 2008, NSF Cyberenabled Discovery Initiative, \$575 192
13. "Planetary Migration in Partially and Fully Magnetized Turbulent Disks," Mac Low, M.-M., & Menou, K. M. 2006, NASA Origins of Solar Systems Program, \$192 000
12. "New techniques for improving the accuracy of gradients for particle and grid simulations of magnetohydrodynamic turbulence," Jason L. Maron, & Mac Low, M.-M. 2006, NSF Program on Interactions Between Mathematics and the Physical Sciences, \$239 174
11. "Stellar Duets in Theory and Observations. Common envelopes, planetary nebulae, and the origin of close binaries," De Marco, O., & Mac Low, M.-M. 2006, NSF Galactic Astronomy, \$410 019
10. "Gas Entrainment and Shock Physics in Giant Protostellar Outflows," Arce, H., Mac Low, M.-M., & Noriega-Crespo, A. 2006, NASA Spitzer Space Telescope, \$83 580
9. "Star Formation in the Large Magellanic Cloud," Chu, Y.-H., Gruendl, R. Looney, L., Chen, R., Williams, R., Mac Low, M.-M., Hartmann, L., Calvet, N., Brandner, W., Smith, C., Points, S., Dickel, J. Spitzer Space Telescope Archival Research Program, \$100 000
8. "Comparing Theory with Observation Using Chemical Probes of Turbulent Molecular Clouds," Glover, S. C. O., & Mac Low, M.-M. 2003, NSF Galactic Astronomy, \$149 912
7. "Collaborative Research: Fireworks at the Ballet: Globular Cluster Formation, Bulge Dynamics and the Role of Central Black Holes in Galaxy Mergers," Mac Low, M.-M., & Haiman, Z. 2003, NSF Extragalactic Astronomy, \$209 537
6. "New Directions in Cluster Computing: A Conference at the American Museum of Natural History," Wheeler, W. C., & Mac Low, M.-M. 2001, NSF, \$15 000
5. "Protostellar Core Formation by Supersonic MHD Turbulence," Mac Low, M.-M. 2000, NASA Astrophysical Theory Program, \$153 516
4. "CAREER: Structure Formation and Support by Supersonic Turbulence in the Interstellar Medium and Star-Forming Regions," Mac Low, M.-M. 2000, NSF Galactic Astronomy, \$350 000
3. "Impact of Comet Shoemaker-Levy 9 on Jupiter: Modelling the First 200 Seconds," Mac Low, M.-M. & Zahnle, K. 1994, NSF Planetary Astronomy, \$29 306

2. “Mechanisms for X-ray Emissions from Superbubbles,” Chu, Y.-H. & Mac Low, M.-M. 1994, NASA ROSAT Observation, \$15 000
1. “Supernova Remnants Hidden in Superbubbles,” Mac Low, M.-M., & Chu, Y.-H. 1993, NASA ROSAT Observation, \$15 000

## Education

9. “AstroCom NYC: A Partnership between New York City Astronomers,” Paglione, T. A., W. Farr, K. S. Ford, D. Robbins, M.-M. Mac Low. 2022, NSF Partnerships for Astronomy & Astrophysics Research & Education, \$1,732,769
8. “OpenSpace: An Engine for Dynamic Visualization of Earth and Space Science for Informal Education and Beyond,” Kinzler, R., Bock, A., Campbell, R., Ebel, D., Emmart, C., Hansen, C., Mac Low, M.-M., Neafus, D., Silva, C., Smith, R., SubbaRao, M., Summers, C., Trakinski, V., Wyatt, R., Ynnerman, A., Yu, K. 2021, NASA SMD Science Education Cooperative Agreement Notice, \$6,667,578
7. “AstroCom NYC: A Partnership between New York City Astronomers,” Paglione, T. A., Bryan, G. L, Ford, K. S., Mac Low, M.-M., Robbins, D. 2018, NSF Partnerships for Astronomy & Astrophysics Research & Education, \$1,253,391 (including funded extension).
6. “OpenSpace: An Engine for Dynamic Visualization of Earth and Space Science for Informal Education and Beyond,” Kinzler, R., Trakinski, V., Emmart, C., Mac Low, M.-M., & Ebel, D. 2016, NASA Science Mission Directorate Education, \$6 289 492.
5. “AstroCom NYC: A Partnership between Astronomers at CUNY, AMNH, and Columbia University,” NSF Partnerships in Astronomy & Astrophysics for Research & Education,” Paglione, T., Mac Low, M.-M., Robbins, D., Agüeros, M. 2011, \$459 833.
4. “An Innovative Approach to Earth Science Teacher Preparation: Uniting Science, Informal Science Education, and Schools to Raise Student Achievement,” 2011, MacDonald, M., Kinzler, R., Mathez, E., Mac Low, M.-M. NSF DRK12, \$2 800 381.
3. “REU Site: Research Experiences for Undergraduates in Earth Science, Planetary Science and Astrophysics at the American Museum of Natural History,” Mac Low, M.-M., & Webster, J. D. 2003, NSF Research Experiences for Undergraduates, \$148 850
2. “Internet DuSable!,” York, D. G., Brown, B. B., Mac Low, M.-M., Lauroesch, J. T., & Charleston, P. C. 1994, NASA Initiative to Develop Education through Astronomy, \$20 000
1. “Astronomy Wilderness Experience,” Mac Low, M.-M., & Brown, B. B. 1993, NASA Astrophysical Grant Supplement for Education, \$5 200

## Computing and Observing Allocations since 2007

I am PI unless otherwise noted.

30. “Interaction of small and large scale galactic dynamos,” PI F. Gent, 6 million core hours, CSC Finland, 2018
29. “Origin of the Highest Velocity Protostellar Outflow,” PI D. Wilner, 1.7 hours at Priority B [likely], Atacama Large Millimeter Array, 2017
28. “The injection, transport, and evolution of dust in supernova-driven interstellar media,” PI J. Slavin, NASA High End Computing, 180K CPU-hours, 2017
27. “Light Echoes and the Environments of Supernovae 2014J and 2016adj,” Hubble Space Telescope observing proposal, 12 orbits + 2.4 hours of Spitzer Space Telescope time. 2016
26. “Searching for Source Variability in W49A at 7 mm,” PI C. De Pree, 4 hours at Priority C [best effort], Jansky Very Large Array, Semester 16B
25. “Formation and Assembly of Massive Star Clusters,” PI S. L. McMillan, NASA High End Computing, 3.932 million CPU-hours, 2016
24. “Star Formation, Feedback, and Chemical Evolution of Dwarf Galaxies,” NSF XSEDE, 1.822 million CPU-hours (valued at \$63K), 2017
23. “Short Circuits in Protoplanetary Disks,” PI A. Hubbard, NASA High End Computing, 3.226 million CPU-hours, 2016
22. “Short Circuits in Protoplanetary Disks,” PI A. Hubbard, NASA High End Computing, 1.28 million CPU-hours, 2016
21. “From Gas to Stars in a Galactic Environment,” NSF XSEDE, 4.378 million CPU-hours (valued at \$152K), 2016
20. “Simulating Young Massive Cluster Formation,” PI J. E. Wall, 19.7 million CPU-hours, Netherlands Organization For Scientific Research, 2016
19. “Formation and Assembly of Massive Clusters,” PI S. L. McMillan, NASA High End Computing, 1.024 million CPU-hours, 2015
18. “Planetesimal Formation in Magnetized Protoplanetary Disks,” PI C.-C. Yang, PRACE [European supercomputer network], 15 million CPU-hours, 2015
17. “Planetesimal Formation in Magnetized Protoplanetary Disks,” PI C.-C. Yang, Swedish National Infrastructure for Computing, 5 million CPU-hours, 2015
16. “Time-Dependent Dynamics in W49A: Confirmation that UC HII Regions Flicker,” PI C. De Pree, Jansky Very Large Array radio telescope, 16 hours observation time, semesters 2015A—2016A,



15. "Star Formation in the Galactic Environment," NSF XSEDE, 3.793M million CPU-hours (valued at \$132K), 2015
14. "The Evolution of Satellite Dwarf Galaxies via Ram Pressure Stripping and Supernova Feedback in a Milky Way type Halo," PI A. Emerick, NSF XSEDE, 50K CPU-hours, 2015
13. "Modeling infall in Milky Way-like galaxies," PI A. S. Hill, NASA High End Computing, 600K CPU-hours, 2015
12. "Short Circuits in Protoplanetary Disks," PI A. Hubbard, NASA High End Computing, 600K CPU-hours, 2015
11. "Simulations of the formation of stars and structure of protoplanetary disks," NSF XSEDE, 3.7M CPU-hours, 2013
10. "Accretion of high-velocity gas," PI: A. S. Hill, ASTAC (Australia), 200K CPU-hours ( ~\$15K at commercial rates), 2012
9. "Simulations of the Formation of Stars and Planets in Disks," NSF XSEDE, 10.989M CPU-hours ( ~\$825K at commercial rates), 2012
8. "Planetesimal Migration in Turbulent Protoplanetary Disks," NASA High End Computing, 3.38M CPU-hours, 2011
7. "Dynamic UC HII Regions in Sgr B2: Flickering and Ionized Flows," Very Large Array radio telescope, 20 hours observing time, 2011
6. "Towards an Initial Mass Function of Planetesimals," PI: A. Johansen, Partnership for Advanced Computing in Europe (PRACE), 6.2M CPU-hours, 2010
5. "Simulations of the Formation of Galaxies, Stars, and Planets," NSF Teragrid, 11.1M CPU-hours, 2010
4. "Planetesimal Dynamics in a Turbulent Protoplanetary Disk," NASA High End Computing, 3.26M CPU-Hours, 2009
3. "The Great Nebula in Carina: Protoplanetary Disks to Starburst Galaxies," PI: L. Townsley, NASA Chandra X-ray Observatory, 1.2Msec observing time, 2008
2. "Astrophysical Simulation of Planet and Star Formation," NSF Teragrid, 945K CPU-hours, 2008
1. "Planetesimal Dynamics in a Turbulent Protoplanetary Disk," NASA High-End Computing, 1.015M CPU-hours, 2008

## Other Publications

### Invited Reviews

31. “Atomic and Molecular Phases of the Interstellar Medium,” Mac Low, M.-M. 2016, in From interstellar clouds to star-forming galaxies: universal processes? eds. F. van der Tak, P. Jablonka, & P. André (Cambridge: Cambridge U. Press), 1-8.
30. “Formation of Molecular Clouds and Global Conditions for Star Formation.” Dobbs, C. L., M. R. Krumholz, J. Ballesteros-Paredes, A. D. Bolatto, Y. Fukui, M. Heyer, M.-M. M. Low, E. C. Ostriker, & E. Vázquez-Semadeni. 2014, in Protostars and Planets VI, eds. H. Beuther, R. S. Klessen, C. P. Dullemond, & T. Henning (Tucson: U. Arizona Press) 3-26. (**refereed**)
29. “From Gas to Stars Over Cosmic Time,” Mac Low, M.-M. 2013, in Molecular Gas, Dust, and Star Formation in Galaxies, eds. J. Ott, & T. Wong (Cambridge: Cambridge U. Press), 3–15.
28. “Modeling High-Mass Star Formation and Ultracompact H II Regions,” Klessen, R. S., Peters, T., Banerjee, R., Mac Low, M.-M., Galván-Madrid, R., & Keto, E. R. 2011, in Computational Star Formation, eds. J. Alves, B. G. Elmegreen, & V. Trimble (Cambridge: Cambridge U. Press), 107–114
27. “Control of galactic scale star formation by gravitational instability or midplane pressure?” Mac Low, M.-M. 2011, in Computational Star Formation, eds. J. Alves, B. G. Elmegreen, & V. Trimble (Cambridge: Cambridge U. Press), 371–375.
26. “Magnetic Helicity and Astrophysical Disk Dynamos,” Oishi, J. S., & Mac Low, M.-M. 2011 in Partially Ionized Plasmas Throughout the Cosmos, eds. V. Florinski, J. Heerikhuisen, G. P. Zank, & D. L. Gallagher. (Heidelberg: Springer) 122–128.
25. “Diffuse Interstellar Medium and the Formation of Molecular Clouds,” Hennebelle, P., Mac Low, M.-M., & Vázquez-Semadeni, E. 2009, in Structure Formation in Astrophysics, ed. G. Chabrier (Cambridge: Cambridge U. Press), 205–227.
24. “Open issues in small- and large-scale structure formation,” Klessen, R. S., & Mac Low, M.-M. 2009, in Structure Formation in Astrophysics, ed. G. Chabrier (Cambridge: Cambridge U. Press), 427–440.
23. “Magnetic Effects in Global Star Formation,” Mac Low, M.-M. 2008, in Rev. Mex. Astron. Astrof. Ser. Conf., 36, 121–127.
22. “Feedback Processes: A Theoretical Perspective,” Mac Low, M.-M. 2008, in Massive Star Formation: Observations Confront Theory, eds. H. Beuther, H. Linz, & Th. Henning. (San Francisco: ASP), 148–157.
21. “Galactic-scale star formation by gravitational instability,” Mac Low, M.-M., Li, Y., & Klessen, R. S. 2007, in Triggered Star Formation in a Turbulent Interstellar Medium, eds. B. G. Elmegreen, & J. Palouš (Cambridge, UK: Cambridge U. Press), 336–343

20. “Molecular Cloud Turbulence and Star Formation,” Ballesteros-Paredes, J., Klessen, R. S., Mac Low, M.-M., & Vázquez-Semadeni, E. 2007, in *Protostars & Planets V*, eds. B. Reipurth, D. Jewitt, & K. Keil (Tucson, AZ: U of Arizona Press), 63–80. (**refereed**)
19. “Stellar Mass Spectra from Non-Isothermal Gravoturbulent Fragmentation,” Klessen, R. S., Jappsen, A.-K., Larson, R. B., Li, Y., & Mac Low, M.-M. 2005, in *IMF50: The Stellar Initial Mass Function Fifty Years Later*, eds. E. Corbelli, F. Palla, & H. Zinnecker (Dordrecht: Kluwer), 363–370.
18. “Magnetized Turbulence,” Mac Low, M.-M. 2005, in *The Magnetized Plasma in Galaxy Evolution*, eds. K. T. Chyży, K. Otmianowska-Mazur, M. Soida, & R. J. Dettmar (Kraków: Jagiellonian U. Press), 41–47
17. “Gravoturbulent Star Cluster Formation,” Klessen, R. S., Ballesteros-Paredes, J., Li, Y., & Mac Low, M.-M. 2004, in *The Formation and Evolution of Massive Young Star Clusters*, eds. H. J. G. L. M. Lamers, L. J. Smith, & A. Nota (San Francisco: Astron. Soc. Pacific) 299–307.
16. “Turbulent Structure of the Interstellar Medium,” Mac Low, M.-M. 2004, in *The Dense Interstellar Medium in Galaxies*, eds. S. Palfzner, C. Kramer, C. Straubmeier, & A. Heithausen (Berlin: Springer Verlag), 379–386.
15. “The Turbulent Interstellar Medium: Insights and Questions from Numerical Models,” Mac Low, M.-M., Avillez, M. A., & Korpi, M. J. 2004, in *How Does the Galaxy Work?*, eds. E. J. Alfaro, E. Pérez, J. Franco (Dordrecht: Kluwer) 339–346.
14. “Turbulence in the Interstellar Medium: Energetics and Driving Mechanisms,” Mac Low, M.-M., 2004, *Astrophys. Space Sci.*, 289, 323–331.
13. “Wolf-Rayet Central Stars and the Binary Evolution Channel,” De Marco, O., Sandquist, E. L., Mac Low, M.-M., Herwig, F., & Taam, R. E. 2003, *Rev. Mex. Astron. Astrofis. (Conf. Ser.)*, 18, 24–30.
12. “MHD Turbulence in Star-Forming Regions,” Mac Low, M.-M. 2003, in *Turbulence and Magnetic Fields in Astrophysics*, eds. E. Falgarone & T. Passot, (Heidelberg: Springer Lecture Notes in Physics), 182–212. (**refereed**)
11. “What Controls the Star-Formation Rate in Galaxies?,” Mac Low, M.-M. 2002, *Astrophys. Sp. Sci.*, 281, 429.
10. “Clustered vs. Isolated Star Formation,” Mac Low, M.-M. 2002, in *Modes of Star Formation and the Origin of Field Populations*, eds. E. K. Grebel & W. Brandner (San Francisco: ASP), 112.
9. “The Dynamical Interstellar Medium: Insights from Numerical Models,” Mac Low, M.-M. 2000, in *Stars, Gas, and Dust in Galaxies*, eds. D. Alloin, K. Olsen, & G. Galaz (San Francisco: ASP), 55.

8. "Is the Plasma within Bubbles and Superbubbles Hot or Cold," Mac Low, M.-M. 1999, in *Astrophysical Plasmas: Codes, Models & Observations*. Mexico City 25-29 October, 1999. Editors: S.J. Arthur, N. Brickhouse and J. Franco. To be published in the *Revista Mexicana de Astronomia y Astrofisica, Serie de Conferencias*, E40.
7. "MHD Turbulence in Star-Forming Clouds," Mac Low, M.-M., Klessen, R. S., and Heitsch, F. 1999, in *Optical and Infrared Spectroscopy of Circumstellar Matter*, eds. S. Klose, E. Günther, & B. Stecklum, (San Francisco: ASP), 177.
6. "The Interaction of the Disk with the Halo" Mac Low, M.-M. 1998, in *New Perspectives on the Interstellar Medium*, eds. A. R. Taylor, T. L. Landecker, and G. Joncas (San Francisco: ASP), 303.
5. "Wolf-Rayet and LBV Nebulae as the Result of Variable and Non-Spherical Stellar Winds," Mac Low, M.-M. 1998, in *IAU Colloquium 169 on Variable and Non-Spherical Stellar Winds in Luminous Hot Stars*, ed. B. Wolf (Heidelberg: Springer-Verlag), 391.
4. "Structure and Dynamics of Magnetized Interstellar Clouds: Super-Alfvénic Turbulence?," Mac Low, M.-M. 1997, in *The Orion Complex Revisited*, ed. M. J. McCaughrean & A. Burkert (San Francisco: Astron. Soc. Pacific), in press.
3. "Superbubble Blowout," Mac Low, M.-M. 1996, in *The Interplay Between Massive Star Formation, the ISM and Galaxy Evolution*, ed. D. Kunth, et al. (Paris: Editions Frontières), 169.
2. "Entry and Fireball Models vs. Observations: What Have We Learned?," Mac Low, M.-M. 1996, in *The Impacts of Comet D/Shoemaker-Levy 9 into Jupiter*, IAU Colloquium 156, ed. K. Noll, (Cambridge: Cambridge University Press), 154. (**refereed**)
1. "Bullets or Fragmenting Shells," Mac Low, M.-M. 1995, *Nature (News & Views)*, 377, 287.

## Conference Proceedings

47. "Dynamical properties of Molecular Cloud Complexes at the Epoch of Reionization," Leung, T. K. D., Pallottini, A., Ferrara, A., and Mac Low, M.-M. 2020, in *Uncovering Early Galaxy Evolution in the ALMA and JWST Era*. Proceedings of the International Astronomical Union, 352, 38-39.
46. "Survival of Dust Created in Cas A Supernova Remnant," Slavin, J., Dwek, E., Mac Low, M.-M., and Hill, A. 2019, in *Supernova Remnants: An Odyssey in Space after Stellar Death II*, Online at <http://snr2019.astro.noa.gr>, id.150 (poster).
45. "Mineral Processing by Short Circuits in Protoplanetary Disks," McNally, C. P., Hubbard, A., Mac Low, M.-M., Ebel, D. S., & D'Alessio, P. 2013, *LPSC Abstracts*, 44, 2844 (2 pp.)

44. “How Common Envelope Interactions Change the Lives of Stars and Planets.” De Marco, O., Passy, J.-C., Herwig, F., Fryer, C. L., Mac Low, M.-M., Oishi, J. S. 2012, in *From Interacting Binaries to Exoplanets: Essential Modeling Tools*, eds. M. T. Richards & I. Hubeny (Cambridge U. Press, Cambridge), 517–520.
43. “MHD simulations of a supernova-driven ISM and the warm ionized medium using a positivity preserving ideal MHD scheme,” Mac Low, M.-M., Hill, A. S., Joung, M. R., Waagan, K., Klingenberg C., Wood, K., Benjamin, R. A., Federrath, C., & Haffner, L. M. 2012, in *Numerical Modeling of Space Plasma Flows (Astronom 2011)*, eds. N. V. Pogorelov, J. A. Font, E. Audit, & G. P. Zank (San Francisco: ASP), 112–117.
42. “Understanding the physics of the X-factor,” Glover, S. C. O., & Mac Low, M.-M. 2011, in *Conditions and impact of star formation: New results with Herschel and beyond*, eds. M. Röllig, R. Simon, V. Ossenkopf, & J. Stutzki (Cambridge: EDP Sciences), 147–150.
41. “Radiative Feedback in Massive Star and Cluster Formation,” Peters, T., Klessen, R. S., Mac Low, M.-M., & Banerjee, R. 2011, in *Stellar Clusters & Associations: A RIA Workshop on GAIA (Granada: Inst. Astrof. Andalucía)*, 229–234.
40. “The importance of initial conditions and metallicity for the fragmentation of protogalactic gas.” Jappsen, A.-K., Glover, S. C. O., Mac Low, M.-M., & Klessen, R. S. 2010, in *Chemical Abundances in the Universe: Connecting First Stars to Planets*, eds. K. Cunha, M. Spite, & B. Barbuy (Cambridge: Cambridge U. Press) 65–66.
39. “Star Formation is Very Rapid in Spiral Galaxies,” Tamburro, D., Rix, H.-W., Walter, F., Brinks, E., de Blok, W. J. G., Kennicutt, R. C., Mac Low, M.-M. 2008, in *Formation and Evolution of Galaxy Disks*, eds. J. G. Funes, S. J., & E. M. Corsini (San Francisco: Astron. Soc. Pac.) 163–164.
38. “The Influence of Metallicity on Star Formation in Protogalaxies”, Jappsen, A.-K., Glover, S. C. O., Klessen, R. S., & Mac Low, M.-M. 2008, in *First Stars III*, eds. T. Abel, A. Heger, & B. O’Shea (Melville, NY: American Institute of Physics), 76–78.
37. “Paleontological and Mineralogical Evidence for a Single K/T Extinction Impact at Chicxulub,” Ebel, D. S., Mac Low, M.-M., & Landman, N. H. 2008, *Lunar Plan. Sci. Conf.*, 39, 1454 (2 pp).
36. “Turbulent Structure and Star Formation in a Stratified, Supernova-Driven, Interstellar Medium,” Joung, M. K. R., & Mac Low, M.-M. 2007, in *Triggered Star Formation in a Turbulent Interstellar Medium*, eds. B. G. Elmegreen, & J. Palouš (Cambridge, UK: Cambridge U. Press), 358–362.
35. “Non-isothermal gravoturbulent fragmentation: effects on the IMF,” Jappsen, A.-K., Klessen, R. S., Larson, R. B., Li, Y., & Mac Low, M.-M. 2005, *Mem. Soc. Astron. Ital.*, 76, 199–204.

34. “Non-Isothermal Gravoturbulent Fragmentation,” Jappsen, A.-K., Klessen, R. S., Larson, R. B., Li, Y., & Mac Low, M.-M. 2005, in *Cores to Clusters: Star Formation with Next Generation Telescopes*. Eds. M. S. Nanda Kumar, M. Tafalla, & P. Caselli (New York: Springer), 77–86.
33. “Chondrule Formation by Current Sheets in Protoplanetary Disks,” Ebel, D. S., Joung, M. K. R., & Mac Low, M.-M. 2004, *Lunar Plan. Sci. Conf.*, 35, 1971. (2 pp.)
32. “Formation of Stellar Clusters in Turbulent Molecular Clouds: Effects of the Equation of State,” Li, Y., Klessen, R. S., & Mac Low, M.-M. 2004, *Baltic Astron.*, 13, 377–380.
31. “Hydrodynamical Simulations of Molecular Dynamics in Supersonic Turbulent Flow,” Pavlovski, G., Smith, M. D., Mac Low, M.-M., & Rosen, A. 2004, *Astrophys. Sp. Sci.*, 292, 69–75.
30. “Molecule Destruction and Formation in Molecular Clouds,” Smith, M. D., Pavlovski, G., Mac Low, M.-M., Rosen, A., Khanzadyan, T., Gredel, R., Stanke, T. 2004, *Astrophys. & Space Sci.*, 298, 333–336.
29. “Mixing in a supernova driven ISM - A 3D parameter Study,” Avillez, M. A., & Mac Low, M.-M. 2003, *Rev. Mex. Astron. Astrofis. (Ser. Conf.)*, 15, 290–292.
28. “Of Wolf-Rayet Central Stars and Common Envelopes,” De Marco, O., Sandquist, E. L., Mac Low, M.-M., Herwig, F., Taam, R. E. 2003, *Rev. Mex. Astron. Astrofis. (Ser. Conf.)*, 15, 34–37
27. “Modelling the Formation of Molecular Clouds with ZEUS-MP,” Glover, S. C. O., Mac Low, M.-M., Smith, M. D., Rosen, A., & Pavlovski, G., 2002, in *Chemistry as a Diagnostic of Star Formation*, eds. C. L. Curry & M. Fich (NRC Press, Ottawa), 35.
26. “The Formation of Stellar Clusters in Turbulent Molecular Clouds: Effects of the Equation of State,” Li, Y., Klessen, R. S., & Mac Low, M.-M. 2002, in *Extragalactic Globular Cluster Systems*, ed. M. Kissler-Patig (Springer, Heidelberg), 32.
25. “Turbulence Driven by Supernova Explosions in a Radiative-Cooling Magnetized Interstellar Medium,” Kim, J., Balsara, D., Mac Low, M.-M. 2001, *J. Korean Astr. Soc.*, 34, 333–335.
24. “3-D Visualizations of Massive Astronomy Datasets with a Digital Dome,” Liu, C. T., Abbott, B., Emmart, C., Mac Low, M.-M., Shara, M., Summers, F. J., & Tyson, N. D. 2001, *ASP Conf. Ser. 225: Virtual Observatories of the Future*, (San Francisco: ASP), 188.
23. “Turbulence Driven by Stellar Outflows,” Mac Low, M.-M. 2000, in *Star Formation from the Small to the Large Scale* ESA Spec. Pub. 445, ed. F. Favata, A. Kaas, & A. Wilson (Noordwijk: ESA ESTEC), 457.

22. “Decay Timescales of MHD Turbulence in Molecular Clouds,” Mac Low, M.-M., Klessen, R. S., Burkert, A., & Smith, M. D., 2000, in *Interstellar Turbulence*, eds. J. Franco & A. Carraminana (Cambridge: Cambridge U. Press), 256.
21. “Effects of Magnetized Turbulence on the Structure and Dynamical Evolution of Molecular Clouds,” Heitsch, F., Mac Low, M.-M., Klessen, R. 1999, in *Plasma Turbulence and Energetic Particles in Astrophysics*, eds. M. Ostrowski, R. Schlickeiser (Krakow: Obs. Astron. of U. Jagiellonski), 103–106.
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