

Nickolas Moeckel

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Citizenship

United States of America

Education

- 2008 PhD in Astrophysics, University of Colorado
 Dissertation Title: Massive Stars, Disks, and Clustered Star Formation
 Advisor: Prof. John Bally
- 2004 MS in Astrophysics, University of Colorado
 Advisor: Prof. John Bally
- 2002 BS with honors in Astronomy and Mathematics, University of Wisconsin
 Advisor: Prof. Joseph Cassinelli

Employment

- 06/2012–
present Postdoctoral Research Fellow
 Universitäts-Sternwarte München, Ludwig Maximilians Universität
 Faculty contacts: Prof. Andreas Burkert and Prof. Thomas Preibisch
- 2009–2012 Postdoctoral Research Assistant
 Institute of Astronomy, University of Cambridge
 Faculty contact: Prof. Cathie Clarke
- 2008–2009 Postdoctoral Research Assistant
 University of St Andrews and University of Exeter (Joint appointment)
 Faculty contacts: Prof. Ian Bonnell and Prof. Matthew Bate

Research Interests

My research comprises of numerical and theoretical explorations of gravitational and hydrodynamical processes and their application to the formation of star clusters, stellar multiples, and planetary systems. Specific questions that I focus on include:

- Collisional N-body dynamics, particularly its importance in early star cluster evolution
- The impact of the surrounding ISM on star cluster and association formation
- Clustered environmental effects on star and planet formation
- The imprint of a clustered origin on the observed field star population
- Gravitational interactions within a planetary system in its natal disk
- Perturbations to planetary systems throughout their lifetime
- The formation of massive stars and binaries

Teaching & Supervisory Roles

ongoing	Collaborative supervision of graduate students at LMU
2011–2012	Supervisor for Part III Astrophysics Projects
2010–2011	IoA, University of Cambridge
2011	Supervisor for visiting summer student projects
2010	IoA, University of Cambridge
2005	Teaching Assistant
2002–2003	Astrophysical and Planetary Sciences Department, University of Colorado
2001–2002	Tutor, Physics Department, University of Wisconsin

Computational Skills & Experience

Collisional N-body integrators (NBODY6, MERCURY, my own codes)
Hydrodynamics; Lagrangian SPH (GADGET), Eulerian codes (Ramses, Athena, FARGO)
Parallel computing at high performance computing centers, including GPU usage
Proficient in several common languages and analyses tools. In descending order of fluency:
C / C++, Python, Mathematica, Fortran, IDL

Professional Memberships & Activities

2007–present	Referee for Astronomy & Astrophysics, Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Planetary and Space Science, Science
2005–present	Member of American Astronomical Society and Division of Dynamical Astronomy
2002–2006	Public Observing Host, Sommers-Bausch Observatory, Boulder Colorado

Invited Talks, Colloquia, & Seminars

2013	“Collisions and binaries in star clusters” Astronomische Gesellschaft meeting, Tübingen, September 26
2012	“Binaries in planet, star, and cluster formation” Astronomy Colloquium, University of Florida, March 21
2012	“Binaries and discs: complicating the planet-planet scattering scenario” ITC seminar, Center for Astrophysics, Harvard University, March 20
2012	“Binaries and discs: complicating the planet-planet scattering scenario” DAMTP seminar, University of Cambridge, February 28
2012	“A trio of binary dynamics: cluster, star, and planet formation” USM Colloquium, Ludwig Maximilians Universität, February 16
2011	“Stellar dynamics and high mass star formation” Seminar, University of Sheffield, June 8
2010	“Dynamics in the embedded phase: accretion, collisions, contraction” Star Clusters in the Era of Large Surveys, Lisbon, September 9
2010	“Accretion and collisions in young dense clusters” Guillermo Haro Workshop, Tonantzintla, Mexico, July 22

- 2009 “Testing massive binary formation scenarios with SPH”
Numerical Astrophysics and its Role in Star Formation, Cardiff, January 21
- 2007 “Disk dissipation and cluster interactions”
TAC seminar, University of California, Berkeley,

Contributed Talks & Seminars

- 2011 “Collisional formation of very massive stars in young dense clusters”
AAS winter meeting, Seattle Washington, January 13
- 2011 “Messy N-body dynamics in star and planet formation”
Seminar, Northwestern University, October 25
- 2010 “Collisional formation of massive stars in accreting clusters”
The Origin of Stellar Masses, Tenerife, October 19
- 2008 “Disk disruption and binary formation in massive protostars”
Thesis talk, AAS winter meeting, Austin Texas, January 7

Other Conference Talks

- 2013 “Exploring cluster-scale triggering in Sco Cen”
AAS winter meeting, Garching, October 13–
- 2013 “Stellar dynamics and the distribution of YSOs”
Protostars and Planets VI, Heidelberg, July 25–
- 2010 “Collisional formation of massive stars in accreting clusters”
The Origin of Stellar Masses, Tenerife, October 19
- 2008 “Disk disruption and binary formation in massive protostars”
Thesis talk, AAS winter meeting, Austin Texas, January 7

Refereed Publications: 21 total, 14 lead author

21. Gieles, M., **Moeckel, N.** & Clarke, C. J., 2012
“Do all stars in the solar neighbourhood form in clusters? A cautionary note on the use of the distribution of surface densities”, *MNRAS* 426, L11–L15.
20. Young, M. D., Bertram, E., **Moeckel, N.** & Clarke, C. J., 2012
“Reliable estimation of the column density in Smoothed Particle Hydrodynamics simulations” *MNRAS* in press. *MNRAS* 426, 1061–1072.
19. Veras, D. & **Moeckel, N.**, 2012
“Disrupting primordial planet signatures: the close encounter of two single-planet exosystems in the Galactic Disc”, *MNRAS* 425, 680–700.
18. **Moeckel, N.**, Holland, C., Clarke, C. J. & Bonnell, I. A., 2012
“The rapid dispersal of low-mass virialized clusters”, *MNRAS* 425, 450–459.
17. **Moeckel, N.** & Veras, D. 2012
“Exoplanets bouncing between binary stars”, *MNRAS* 422, 831–840.
16. **Moeckel, N.** & Goddi, C. 2012
“Circumbinary disc survival during binary-single scattering: towards a dynamical model of the Orion BN/KL complex”, *MNRAS* 419, 1390–1401.

15. Kruijssen, J. M. D., Maschberger, T., Moeckel, N., Clarke, C. J., Bastian, N., Bonnell, I. A., 2012, “The dynamical state of stellar structure in star-forming regions”, *MNRAS* 419, 841–853.
14. Moeckel, N. & Armitage, P. J., 2012
“Hydrodynamic outcomes of planet scattering in transitional discs”, *MNRAS* 419, 366–376.
13. Moeckel, N. & Clarke, C. J., 2011
”The formation of permanent soft binaries in dispersing clusters”, *MNRAS* 415, 1179–1187.
12. Bally, J., Cunningham, N. J., Moeckel, N., Burton, M. G., Smith, N., Frank, A. & Nordlund, Å., 2011
“Explosive Outflows Powered by the Decay of Non-hierarchical Multiple Systems of Massive Stars: Orion BN/KL”, *ApJ* 727, 113–126.
11. Moeckel, N. & Clarke, C. J., 2011
“Collisional formation of very massive stars in dense clusters“, *MNRAS* 410, 2799–2806.
10. Weidner, C., Bonnell, I. A. & Moeckel, N., 2010
“Escaping stars from young low-N clusters”, *MNRAS* 410, 1861–1869.
9. Moeckel, N. & Bate, M. R., 2010
“On the evolution of a star cluster and its multiple stellar systems following gas dispersal”, *MNRAS* 404, 721–737.
8. Moeckel, N. & Bonnell, I. A., 2009
“Does subcluster merging accelerate mass segregation in local clusters?”, *MNRAS* 400, 657–664.
7. Moeckel, N. & Throop, H. B., 2009
“Bondi-Hoyle-Lyttleton Accretion onto a Protoplanetary Disk”, *ApJ* 707, 268–277.
6. Moeckel, N. & Bonnell, I. A., 2009
“Limits on initial mass segregation in young clusters”, *MNRAS* 396, 1864–1874.
5. Cunningham, N. J., Moeckel, N. & Bally, J., 2009
“A Pulsed, Precessing Jet in Cepheus A”, *ApJ* 692, 943–954.
4. Moeckel, N., Raymond, S. N. & Armitage, P. J., 2009
“Extrasolar Planet Eccentricities from Scattering in the Presence of Residual Gas Disks”, *ApJ* 688, 1361–1367.
3. Moeckel, N. & Bally, J., 2007
“Binary Capture Rates for Massive Protostars”, *ApJ* 661, L183–L186.
2. Moeckel, N. & Bally, J., 2007
“Capture-formed Binaries via Encounters with Massive Protostars”, *ApJ* 656, 275–286.
1. Moeckel, N. & Bally, J., 2006
“Stellar Encounters with Massive Star-Disk Systems”, *ApJ* 653, 437–446.

Submitted publications

1. Moeckel, N. & Bonnell, I. A., 2013
“Primordial triples and collisions of massive stars”, submitted to *MNRAS*, arXiv1301.6959

Non-refereed Conference Proceedings

5. **Moeckel, N.** 2012
“Dynamics in the embedded phase: accretion, collisions, contraction”,
Star Clusters in the Era of Large Surveys, p. 131.
4. Bally, J., **Moeckel, N.** & Throop, H., 2005
“Evolution of UV-Irradiated Protoplanetary Disks”, ASP Conf. Series 341, p. 81.
3. Bally, J., Cunningham, N. J., **Moeckel, N.** & Smith, N., 2005
“Nearby Regions of Massive Star Formation”, IAUS 227, p. 12.
2. Nelms, K. L., Galeazzi, M., Liu, D., McCammon, D., **Moeckel, N.**, Sanders, W. T., Tan, P.,
2002, “Fabrication of IR blocking filter for low energy x-ray applications”,
AIP Conf. Proc. 605, p. 399.
1. **Moeckel, N.**, Galeazzi, M., Lindeman, M., & Stahle, C. K., 2002
“A constant temperature TES microcalorimeter with an external electronic feedback
system”, AIP Conf. Proc. 605, p. 111.