Dr. John A. ZuHone: Curriculum Vitae

Personal

Citizenship	United States of America
Address	Kavli Institute for Astrophysics and Space Research
	Massachusetts Institute of Technology
	77 Massachusetts Ave., 37-582G
	Cambridge, MA 02139
Phone	(617) 253-2354
E-mail	jzuhone@mit.edu
Web	http://www.jzuhone.com

Education

Ph. D. in Astronomy and Astrophysics, University of Chicago	2009
Advisor: Prof. Donald Q. Lamb, Dept. of Astronomy and Astrophysics	
Thesis: "Simulations of Binary Galaxy Cluster Mergers: Modeling Real Clusters and Exploring Parameter Spaces"	
M. S. in Astronomy and Astrophysics, University of Chicago	2004
B. S. in Physics, University of Illinois at Urbana-Champaign	2002

Honors, Awards, and Named Fellowships

NASA Postdoctoral Program	2011-2014
Department of Energy Computational Science Graduate Fellowship	2004-2008
McCormick Fellowship, University of Chicago	2002-2003
Graduated With Highest Honors in Physics, University of Illinois	2002

Research Interests

Astrophysics

Cosmology; large-scale structure formation; galaxy clusters; intracluster medium; dark matter; X-ray astronomy

Computational Science

Developing numerical algorithms for computational physics; developing visualization and analysis techniques for large datasets; development of scientific software in the Python and Julia languages

Research Positions Held

Kavli Institute for Astrophysics, Massachusetts Institute of Technology
Postdoctoral Research Associate 2014-

Astrophysics Science Division, NASA/Goddard Space Flight Center
Postdoctoral Research Associate 2011-2014

High-Energy Astrophysics Division, Smithsonian Astrophysical Observatory
Postdoctoral Research Associate 2009-2011

National Center for Computational Sciences, Oak Ridge National Laboratory
Graduate Research Assistant 2006

Department of Astronomy and Astrophysics, University of Chicago
Graduate Research Assistant 2004-2009

Teaching Experience

NASA/Goddard Space Flight Center, Volunteer Instructor 2014
Python Boot Camp
http://asd.gsfc.nasa.gov/conferences/pythonbootcamp/2014/

Trinity International University, Instructor
Physics 350, "Topics in Physical Science: Astronomy" 2007

University of Chicago, Graduate Teaching Assistant
PHSC 12000, "The Origin of the Universe and How We Know" 2003
PHSC 11900, "Stellar Astronomy and Astrophysics" 2003

University of Illinois at Urbana-Champaign, Undergraduate Teaching Assistant
PHYS 102, "College Physics: E&M & Modern" 2002
PHYS 111, "University Physics: Mechanics" 2002
PHYS 101, "College Physics: Mech & Heat" 2001
PHYS 111, "University Physics: Mechanics" 2001

Grants as Co-Investigator

National Aeronautics and Space Administration
ROSES-12: "Investigating Microphysics of Intracluster Medium 2012
with Advanced Hydrodynamic Simulations and X-Ray
Observations", PI: Maxim Markevitch, 12-ATP12-0159

Computing Allocations as Principal Investigator or Co-Investigator

National Aeronautics and Space Administration

    "Studying the Detailed Physics of the Intracluster Medium in   2011-
        Mergers of Clusters of Galaxies" (Co-I)
        NAS Pleiades SGI ICE system (8,355,847 core-hours)

National Science Foundation / XSEDE

    "Studying the Detailed Physics of the Intracluster Medium in   2010-2011
        Clusters of Galaxies with the FLASH Code" (PI)
        NICS Cray XT5 (1,100,000 service units)

    "Exploring the Nature of Cold Fronts in Merging Clusters of   2009-2010
        Galaxies with the FLASH Code" (Co-I)
        TACC Sun Constellation Cluster (1,000,000 service units)

Professional Service

Review Panel Member

    Astrophysics Theory Proposal (NASA)
    Chandra X-ray Observatory (NASA)

Collaborations

    Astro-H Science Working Group

Peer Review

    The Astrophysical Journal
    Monthly Notices of the Royal Astronomical Society
    Proceedings of the Astronomical Society of Japan

Contributions to Scientific Software

FLASH (http://flash.uchicago.edu), co-developer

    A multiphysics grid-based simulation code for astrophysics. Assisting in development of the particle, cosmology, multigrid gravity, and magnetohydrodynamic modules for FLASH3 and FLASH4

yt (http://yt-project.org), co-developer

    A visualization and analysis software suite for astrophysical simulation data. Assisted in development of FLASH, Athena, and FITS data interfaces; improved capabilities for working with in-memory datasets; developed analysis modules for synthetic observations

YT (http://www.jzuhone.com/yt_julia), sole developer
> A Julia (http://julialang.org) wrapper for yt. Used for
> exposing astrophysical simulation simulation data from a variety of
> different codes in the Julia technical programming language.

pywwt (http://www.jzuhone.com/pywwt), sole developer
> A Python interface to the Microsoft World Wide Telescope
> (WWT) Windows client. Used for controlling WWT from Python.

Spectral Cube (http://spectral-cube.readthedocs.org/en/latest/), co-developer
> A Python package for reading, writing, and analyzing radio "data cubes"
> in the FITS format. Developed an interface to the *yt* software package.

Computing Proficiency and Experience

Programmming Languages
> proficient in: C, Fortran 77/90, Python
> conversant in: IDL, Julia, C++

Simulation Codes
> FLASH (http://flash.uchicago.edu)
> Athena (http://www.astro.princeton.edu/~jstone/athena.html)
> Enzo (http://enzo-project.org)

Software and Libraries
> MPI (parallel computing library, http://www.mcs.anl.gov/research/projects/mpi/)
> HDF5 (hierarchical data format, http://www.hdfgroup.org)
> yt (analysis software for astrophysics simulations, http://yt-project.org)
> CIAO (Analysis tools for *Chandra* data, http://cxc.cfa.harvard.edu/ciao/)
> Version Control Systems: Subversion, Mercurial, Git
> Operating Systems: Linux, Mac OS X, Windows

High-Performance Computing Platforms
> "Intrepid" BlueGene/P: Argonne National Laboratory / DOE
> "Jaguar" Cray XT5: Oak Ridge National Laboratory / DOE
> "Ranger" Sun Constellation: Texas Advanced Computing Center / XSEDE
> "Pleiades" SGI ICE X: Ames Research Center / NASA
> "Kraken" Cray XT5, National Institute for Computational Science / XSEDE

Recent Invited Colloquia and Conference Participation

"Galaxy Cluster Gas Motions and *Astro-H*: Predictions and Challenges from
> Simulations." Talk, Snowcluster 2015 Meeting, March 2015, Snowbird, UT

"Chandra, Cold Fronts, and ICM Physics: The Importance of Magnetic Fields."
Talk, 15 Years of Chandra Science Workshop, November 2014, Boston, MA

"The Physics of Gas Sloshing in Galaxy Clusters." Astrophysics Science Division
Colloquium, NASA/Goddard Space Flight Center, August 2014, Greenbelt, MD

"Simulating X-ray Observations with Python", Talk, Scientific Computing in Python
2014, July 2014, Austin, TX

"The Physics of Gas Sloshing in Galaxy Clusters." Theory Seminar, The Ohio
State University, April 2014, Columbus, OH

"The Physics of Gas Sloshing in Galaxy Clusters." Colloquium, University of Illinois at
Urbana-Champaign, February 2014, Urbana, IL

"The Physics of Gas Sloshing in Galaxy Clusters." Colloquium, Naval Research
Laboratory, September 2013, Washington, DC

"Simulating Radio Mini-halos in Sloshing Galaxy Clusters." Invited talk,
Snowcluster 2013 Meeting, March 2013, Snowbird, UT

"The Physics of Gas Sloshing in Galaxy Clusters." Colloquium, Texas A&M
University, February 2013, College Station, TX

"The Physics of Gas Sloshing in Galaxy Clusters." Theory Seminar, University
of Texas at Austin, February 2013, Austin, TX

Publications

Journal articles (refereed and submitted)

ZuHone, J., Markevitch, M., & Zhuravleva, I., "Mapping the Gas Turbulence in the
Coma Cluster: Predictions for Astro-H." 2015, arXiv:1505.07848

ZuHone, J., Brunetti, G., Giacintucci, S., & Markevitch, M. "Secondary Models for
Radio Mini-Halos in Galaxy Clusters with MHD Simulations of Gas Sloshing." 2015,
ApJ, 801, 146

ZuHone, J. A., Kunz., M. W., Markevitch, M., Stone, J. M., & Biffi, V. "The Effect of
Anisotropic Viscosity on Cold Fronts in Galaxy Clusters." 2015, ApJ, 798, 90

C. Schmid, T. Brand, H. Brunner, A. Finoguenov, **J. ZuHone**, G. Israel, G. Lamer, M.
Oertel, R.K. Smith, M. Wille, J. Wilms. "The Generic X-ray Instrument Simulation
Toolkit SIXTE." 2014, submitted to *Astronomy and Computing*

Komarov, S.V., Churazov, E.M., Schekochihin, A.A., & **ZuHone, J.A.** "Suppression of Local Heat Flux in a Turbulent Magnetized Intracluster Medium." 2014, MNRAS, 440, 2

Giacintucci, S., Markevitch, M., Brunetti, G., **ZuHone, J.**, Venturi, T., Mazzotta, P., Bourdin, H. "Mapping the Particle Acceleration in the Cool Core of the Galaxy Cluster RX J1720.1+2638." 2014, ApJ, 795, 73

Dubey, A., Antypas, K., Calder, A. C., Daley, C., Fryxell, B., Gallagher, J. B., Lamb, D. Q., Lee, D., Olson, K., Reid, L. B., Rich, P., Ricker, P. M., Riley, K. M., Rosner, R., Siegel, A., Taylor, N. T., Weide, K., Timmes, F. X., Vladimirova, N., & **ZuHone, J.** "Evolution of FLASH, a Multiphysics Scientific Simulation Code for High Performance Computing." 2014, *International Journal of High Performance Computing Applications*, 28, 2

Lal, D. V., Kraft, R. P., Randall, S. W., Forman, W. R., Nulsen, P. E. J., Roediger, E., **ZuHone, J. A.**, Hardcastle, M. J., Jones, C., & Croston, J. H. "Gas Sloshing and Radio Galaxy Dynamics in the Core of the 3C449 Group." 2013, ApJ, 764, 83

ZuHone, J. A., Markevitch, M., Brunetti, G., & Giacintucci, S. "Turbulence and Radio Mini-halos in the Sloshing Cores of Galaxy Clusters." 2013, ApJ, 762, 78

ZuHone, J. A., Markevitch, M., Ruszkowski, M., & Lee, D. "Cold Fronts and Gas Sloshing in Galaxy Clusters with Anisotropic Thermal Conduction." 2013, ApJ, 762, 69

Dubey, A., Daley, C., **ZuHone, J.**, Ricker, P., Weide, K., & Graziani, C. "Imposing a Lagrangian Particle Framework on an Eulerian Hydrodynamics Infrastructure in FLASH." 2012, ApJS, 201, 27

Johnson, R. E., **ZuHone, J. A.**, Jones, C., Forman, W., & Markevitch, M. "Sloshing Gas in the Core of the Most Luminous Galaxy Cluster RXJ 1347.5-1145." 2012, ApJ, 751, 95

Roediger, E., & **ZuHone, J. A.** "Fast Simulations of Gas Sloshing and Cold Front Formation." 2012, MNRAS, 419, 1338

ZuHone, J. A., Markevitch, M., & Lee, D. "Sloshing of the Magnetized Cool Gas in the Cores of Galaxy Clusters." 2011, ApJ, 743, 16

ZuHone, J. A. "A Parameter Space Exploration of Galaxy Cluster Mergers I: Gas Mixing and the Generation of Cluster Entropy." 2011, ApJ, 728, 54

ZuHone, J. A., Markevitch, M., & Johnson, R. E. "Stirring Up the Pot: Can Cooling Flows In Galaxy Clusters Be Quenched By Gas Sloshing?" 2010, ApJ, 717, 908

ZuHone, J. A., Ricker, P. M., Lamb, D. Q., & Yang, H. Y. "A Line-Of-Sight Galaxy Cluster Collision: Simulated X-Ray Observations." 2009, ApJ, 699, 1004

ZuHone, J. A., Lamb, D. Q., & Ricker, P. M. "Rings of Dark Matter in Collisions Between Clusters of Galaxies." 2009, ApJ, 696, 694

Zingale, M., Dursi, L. J., **ZuHone, J.**. Calder, A. C., Fryxell, B., Plewa, T., Truran, J. W., Caceres, A., Olson, K., Ricker, P. M., Riley, K., Rosner, R., Siegel, A., Timmes, F. X., & Vladimirova, N. "Mapping Initial Hydrostatic Models in Godunov Codes." 2002, ApJS, 143, 539

Conference proceedings

John A. ZuHone, Veronica Biffi, Eric J. Hallman, Scott W. Randall, Adam R. Foster, and Christian Schmid. "Simulating X-ray Observations with Python." In Stéfan van der Walt and James Bergstra, editors, Proceedings of the 13th Python in Science Conference, pages 103 – 110, 2014.

ZuHone, J., Markevitch, M., & Brunetti, G. "Testing the Connection Between Radio Mini-halos and Core Gas Sloshing with MHD Simulations" 2011, in Non-thermal Phenomena in Colliding Galaxy Clusters, G. Ferrari, M. Brüggen, G. Brunetti, and T. Venturi, eds. (Pisa, Italy: Journal of the Italian Astronomical Society), 632

ZuHone, J., & Markevitch, M. "Cluster Core Heating from Merging Subclusters" 2009, in The Monster's Fiery Breath: Feedback in Galaxies, Groups, and Clusters, S. Heinz and E. Wilcots, eds. (Melville, NY: AIP Press), 383