Dr. Matt R. Mechtley

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Education

Arizona State University, 2009–2013
Ph.D. Astrophysics
Dissertation: *Markov Chain Monte Carlo Modeling of High-Redshift Quasar Host Galaxies in Hubble Space Telescope Imaging*

Arizona State University, 2002–2007
B.S. Mathematics, *Magna Cum Laude*

Professional Experience

Postdoctoral Scholar — Dec. 2015–Present
Arizona State University — Prof. Rogier Windhorst
Continued work on quasar host galaxies at $z = 2$ and $z = 6$, examining the evidence (or lack thereof) for a strong quasar-merger connection among the most strongly *accreting* quasars. Improved methods for MCMC quasar point source modeling and subtraction. Authored HST proposals. Co-supervision and advisement of bachelor's students.

Wissenschaftlicher Mitarbeiter (Staff Sci.) — Dec. 2013–Dec. 2015
Max Planck Institute for Astronomy — Dr. Knud Jahnke
UV/Optical imaging and point source subtraction of quasar host galaxies at $z = 0$, $z = 2$, and $z = 6$. Critical analysis of the (lack of) evidence for a strong quasar-merger connection among massive quasars. Statistical methods for analysis and combination of expert- and citizen scientist-classified galaxy morphologies. Authored HST, ESO, IRAM proposals, prepared HST Phase II observations. Co-supervision and advisement of bachelor's and master's students.

Graduate Research Assistant — Aug. 2010–Dec. 2013
Arizona State University — Prof. Rogier Windhorst
Point-source modeling and subtraction on $z = 6$ and $z = 2$ quasars. Reduced and analyzed HST imaging data. Authored automated data reduction pipeline for the HIPPIES HST survey (PI H. Yan, 62 fields $\times$ 4 filters) and WFC3IR imaging of the SXDF (PIs E. Egami & L. Jiang, 34 fields $\times$ 3 filters). Authored HST, NOAO proposals. Prepared HST Phase II observation. Awarded HST GO program 12974 (25 orbits, see below).

Graduate Research Assistant — Dec. 2009–Aug. 2010
Arizona State University — Prof. Mark Robinson
Reduced and analyzed Lunar Reconnaissance Orbiter data, including LROC visible and Mini-RF radar observations of the lunar surface. Researched cratering and surface weathering processes as traced by surface rock populations.

Simulations Programmer — Sept. 2007–Jul. 2009
Flashbang Studios, LLC
System development and programming for games, simulations, visualizations, and other interactive media. Emphasis on physics simulation, 3-dimensional graphics and animation, developing autonomous agents, web integration, and hardware support.

Undergraduate Research Assistant — Aug. 2006–Sept. 2007
Arizona State University — Prof. Rogier Windhorst
Developed a cross-platform interactive simulation of the Hubble Ultra Deep Field, allowing users to move about the dataset in three dimensions. Incorporated the Friedmann-Lemaître-Robertson-Walker metric to demonstrate non-Euclidean aspects of the expanding Universe's geometry and other key concepts in cosmology.

Grants and Awards

2012–2013
Hubble Space Telescope Cycle 20 GO Program 12974 (25 Orbits)
WFC3/IR Imaging of UV-Faint z=6 Quasars: Star-Forming Host Galaxies of AGN in the Early Universe $152,152

January 2012
AAS Chambliss Astronomy Achievement Student Award, Honorable Mention
WFC3 Imaging of z=6 Quasars: Examining AGN Host Galaxies in the Early Universe

May 2011
School of Earth and Space Exploration Graduate Research Merit Award
WFC3 Imaging of $z \sim 6$ QSO Host Galaxies $1,800

August 2006
NASA Space Grant Undergraduate Research Fellowship
Appreciating Hubble At Hyper-speed: A Web Tool for Astronomy Education $3,000, 2 semesters

First-Author Refereed Publications

Hubble Space Telescope Imaging of FIR-Luminous Quasar Hosts at $z = 6$ **M. Mechtley**, R. A. Windhorst, K. Jahnke, et al. 2015, in preparation

Is Black Hole Growth at $z = 2$ Triggered By Major Mergers? **M. Mechtley**, K. Jahnke, R. A. Windhorst, et al. 2016, accepted to ApJ

Markov Chain Monte Carlo Modeling of High-Redshift Quasar Host Galaxies in Hubble Space Telescope Imaging **M. Mechtley** 2014, Ph.D. Thesis, Arizona State University, Tempe, AZ, USA

Near-Infrared Imaging of a $z = 6.42$ Quasar Host Galaxy With The Hubble Space Telescope Wide Field Camera 3 **M. Mechtley**, R. A. Windhorst, R. E. Ryan, G. Schneider, S. H. Cohen, et al. 2012, ApJ, 756, L38

Other Refereed Publications

Physical Properties of Spectroscopically Confirmed Galaxies at z >= 6. III. Stellar Populations from SED Modeling with Secure Lyα Emission and Redshifts L. Jiang, K. Finlator, S. H. Cohen, E. Egami, R. A. Windhorst, X. Fan, R. Dav, N. Kashikawa, **M. Mechtley**, et al. 2016, ApJ, 816, 16

Physical Properties of Spectroscopically Confirmed Galaxies at z >= 6. II. Morphology of the Rest-frame UV Continuum and Lyα Emission L. Jiang, E. Egami, X. Fan, R. A. Windhorst, S. H. Cohen, R. Davé, K. Finlator, N. Kashikawa, **M. Mechtley**, et al. 2013, ApJ, 773, 153

Physical Properties of Spectroscopically Confirmed Galaxies at z >= 6 I. Basic Characteristics of the Rest-frame UV Continuum and Lyα Emission L. Jiang, E. Egami, **M. Mechtley**, X. Fan, et al. 2013, ApJ, 772, 99

The Size Evolution of Passive Galaxies: Observations from the Wide Field Camera 3 Early Release Science Program R. E. Ryan Jr., P. J. McCarthy, S. H. Cohen, H. Yan, N. P. Hathi, A. M. Koekemoer, M. J. Rutkowski, **M. Mechtley**, et al. 2012, ApJ, 749, 53

Hubble Space Telescope Observations of Field Ultracool Dwarfs at High Galactic Latitude R. E. Ryan Jr., P. A. Thorman, H. Yan, X. Fan, L. Yan, **M. Mechtley**, et al. 2011, ApJ, 739, 83

The Surficial Nature of Lunar Swirls as Revealed by the Mini-RF Instrument C. D. Neish, D. T. Blewett, D. B. J. Bussey, S. J. Lawrence, **M. Mechtley**, et al. 2011, Icarus, 215, 186

The Hubble Space Telescope Wide Field Camera 3 Early Release Science Data: Panchromatic Faint Object Counts for 0.2-2 μm Wavelength R. A. Windhorst, S. H. Cohen, N. P. Hathi, P. J. McCarthy, R. E. Ryan, Jr., H. Yan, I. K. Baldry, S. P. Driver, J. A. Frogel, D. T. Hill, L. S. Kelvin, A. M. Koekemoer, **M. Mechtley**, et al. 2011, ApJS, 193, 27

Conference Presentations and Posters

Markov Chain Monte Carlo Galfitting **M. Mechtley** 2015, Python in Astronomy, Apr. 2015

Host Systems of $z = 6$ Quasars: Evidence for Mergers or Dense Environments **M. Mechtley**, R. A. Windhorst, K. Jahnke, L. Jiang, et al. 2015, South by High$-z$, Apr. 2015

Quasar Host Galaxies at z=2 and z=6: Point Source Subtraction With MCMC **M. Mechtley**, A. M. Koekemoer, K. Jahnke, B. Smith, et al. 2013, AAS #221, Jan. 2013

WFC3 Imaging of z=6 Quasars: Examining AGN Host Galaxies in the Early Universe **M. Mechtley**, R. A. Windhorst, R. E. Ryan, S. H. Cohen, G. Schneider, et al. 2012, AAS #219, Jan. 2012

WFC3 Imaging of z=6 QSO Hosts: A Method for PSF Characterization and Subtraction **M. Mechtley**, R. A. Windhorst, G. Schneider, S. H. Cohen, X. Fan, et al. 2011, AAS #217, Jan. 2011

Coordinated Radar and Optical Observations of Young Craters With Obscured Ejecta Blocks **M. Mechtley**, S. J. Lawrence, M. S. Robinson, D. B. J. Bussey, & G. W. Patterson NASA Lunar Science Forum #3, July 2010

Coordinated LROC and Mini-RF Observations of the Lunar Surface S. J. Lawrence, **M. Mechtley**, P. D. Spudis, D. B. J. Bussey, & M. S. Robinson LPSC #41, Mar. 2010

The "Appreciating Hubble At Hyper-speed" Web-tool and Curriculum L. M. Will, **M. Mechtley**, S. H. Cohen, R. A. Windhorst, N. Pirzkal, et al. AAS #211, Jan. 2008

Appreciating Hubble at Hyperspeed: A Teaching Tool for Students & Educators **M. Mechtley**, R. A. Windhorst, L. M. Will, & S. H. Cohen Arizona/NASA Space Grant Undergraduate Research Program Statewide Symposium, Apr. 2007

Appreciating Hubble at Hyper-speed: A Web-tool for Students and Teachers L. M. Will, **M. Mechtley**, S. H. Cohen, R. A. Windhorst, S. Malhotra, et al. AAS #209, Jan. 2007

Open-Source and Public Software

psfMC MCMC 2D surface brightness modeling for quasar / host galaxy decompositions `https://github.com/mmechtley/psfMC`

fitsstamp Python module and command-line utilities for cutting and pasting small "stamp" images from astronomical FITS image files `https://github.com/mmechtley/fitsstamp`

SextractorTools Python module for manipulating Sextractor source catalogs `https://github.com/mmechtley/SextractorTools`

astroRMS Python module for estimating correlated noise in drizzled images and generating scaled weight maps. `https://github.com/mmechtley/astroRMS`

HSTFocusModel Python script interface to the web-based HST Focus Model hosted online at STScI `https://github.com/mmechtley/HSTFocusModel`

ned_extinction_calc Python programmatic interface to the web-based NED Galactic Extinction Calculator. Query A_λ for any filter at any position, programmatically. `https://github.com/mmechtley/ned_extinction_calc`

Technical Skills and Proficiencies

Computational Methods

Point Spread Function Modeling, 2D Surface Brightness Modeling, Markov Chain Monte Carlo, Bayesian Inference, Automation and Pipeline Development, Real-time Interactive Simulation and Visualization

Operating Systems

Mac OS X, Linux/Unix, Windows

Programming Languages

Python, C#, C, Objective-C, Perl, IDL, Java, Javascript, PHP, C++

Software

Astrodrizzle, TinyTim, webbpsf/poppy, GalFit, SExtractor, IRAF, APT, aXe, LaTeX, Unity 3D, Adobe Photoshop and Illustrator

Teaching Experience

Instructor, Astronomy Lab I, Arizona State University, Fall 2009

Service and Outreach

Vice President, Arizona State University Astronomy Open House, 2009–2012

Council Member, School of Earth and Space Exploration Graduate Student Council, 2009–2010

Education and Public Outreach projects for ASU School of Earth and Space Exploration, Arizona/NASA Space Grant Consortium, Arizona Museum of Natural History, and Arizona Science Center, 2006–2013

Officer, Arizona State University Math Club, 2006–2007