

## Dr. Matt R. Mechtley

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222 Lake Ella Dr Apt B4  
Tallahassee, FL 32303  
United States

Phone: +1.312.483.7058  
mmechtley@gmail.com  
<http://github.com/mmechtley>

### 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. 2017, in preparation

*Is Black Hole Growth at  $z = 2$  Triggered By Major Mergers?* **M. Mechtley**, K. Jahnke, R. A. Windhorst, et al. 2016, ApJ, 830, 156

*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  $z \geq 6$ . III. Stellar Populations from SED Modeling with Secure Ly $\alpha$  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  $z \geq 6$ . II. Morphology of the Rest-frame UV Continuum and Ly $\alpha$  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  $z \geq 6$  I. Basic Characteristics of the Rest-frame UV Continuum and Ly $\alpha$  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  $\mu\text{m}$  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  $A_\lambda$  for any filter at any position, programmatically. [https://github.com/mmechtley/ned\\_extinction\\_calc](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, L<sup>A</sup>T<sub>E</sub>X, 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