

# Michele L. Silverstein

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NASA Postdoctoral Program Fellow, RECONS Team Member

## Education

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- **Georgia State University** **Atlanta, GA**  
*Doctor of Philosophy, Astronomy* 2012–2019
- **Georgia State University** **Atlanta, GA**  
*Master of Science, Physics* 2012–2016
- **Cornell University** **Ithaca, NY**  
*Bachelor of Arts, Physics, Astronomy Concentration* 2008–2012

## Research Experience

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- **NASA Postdoctoral Program Fellow** **August, 2019 - present**  
*NASA Postdoctoral Program, NASA Goddard Space Flight Center* *Mentor: Dr. Joshua E. Schlieder*  
As part of my postdoctoral fellowship, I am now working on characterizing nearby low-mass stars and their planets detected by *TESS*, with a focus on individual systems, stellar activity, stellar parameter determination, and analysis of large samples.
- **Graduate Researcher** **Spring 2013 - Summer 2019**  
*RECONS Institute & Georgia State University* *Mentor: Prof. Todd J. Henry*  
My interests lie in characterizing the nearby stellar population - I have determined the fundamental properties (temperature, luminosity, radius) of  $\sim 1500$  red dwarfs within 25 parsecs using optical to mid - IR photometry, parallax data, and a spectral energy distribution fitting technique. This involved about 6 months of observing time with small telescopes in both hemispheres. Within this sample and using these data, I have detected a candidate subsample of young stars and subdwarfs, which stand out from ordinary main sequence stars due to their relatively large and small radii. I have also revealed trends in radius and effective temperature as a function of spectral type.
- **SMARTS Graduate Fellow** **2015 - 2018**  
*Georgia State University*
  - Advertise the SMARTS 1.5-m, 1.3-m, and 0.9-m telescopes at CTIO
  - Schedule time on the SMARTS 0.9-m telescope
  - Serve as 0.9-m user support
  - Maintain 0.9-m computer disks
  - Save and flat field+bias subtract all RECONS data
  - Fully reduce all RECONS absolute photometry
  - Modernize and update the SMARTS 0.9m manual
  - Smooth transitions to updated systems and engineering
- **Second La Serena School for Data Science 2014 Participant** **August, 2014**  
*AURA Campus, La Serena, Chile* *Mentor: Prof. Amelia Bayo*

Week long intensive school devoted to introducing machine learning, Bayesian statistics, MySQL, Python, the Virtual Observatory and other relevant tools for working with big data.

Developed and worked through a group project searching for high proper motion objects using MySQL and various Virtual Observatory tools, including Aladin and TOPCAT, and identified brown dwarfs using machine learning.

### **NASA Intern**

**Summer 2012**

- *Goddard Spaceflight Center, Greenbelt, MD*

*Mentor: Dr. Negar Ehsan*

Completed the construction of a terahertz frequency light source used to (1) characterize silicon and other samples and (2) test properties of instrument components such as filters, antennas and dividers, particularly those related to the wafer-scale spectrometer known as MicroSpec.

### **Undergraduate Research Assistant**

**Fall 2010, Spring 2012**

- *Cornell University, Ithaca, NY*

*Mentor: Prof. Gordon Stacey*

Wrote a PID control loop using LabVIEW to maintain the bolometer temperature in the submillimeter spectrometer, ZEUS II. Integrated PID loop with existing software and hardware.

Wrote a stepper motor control LabVIEW program to improve control of ZEUS II's cooling system.

### **REU Fellow**

**Summer 2011**

- *SUNY Stony Brook, Stony Brook, NY*

*Mentor: Prof. Michal Simon*

Devised a method to check stars for cool debris disks using Microsoft Excel and the WISE database. Contributed to understanding of several cool debris disks in the nearby young moving group Eta/Epsilon Chameleon. *Publication.*

### **Undergraduate Research Assistant**

**Spring 2011**

- *Cornell University*

*Mentor: Dr. Kevin Covey*

Developed an IDL program to analyze NGC 752 open cluster data and search for transiting planets.

## **Skills, Tools, and Techniques**

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### Observing and Data Processing

- Photometry to Derive Magnitudes
- Astrometry
- Relative Photometry
- Telescope Management  
(see SMARTS Graduate Fellowship)

### Software and Packages

- IRAF
- LaTeX
- TOPCAT & Stilts
- AutoCAD
- Microsoft Office

### Programming

- IDL
- Python
- *Elementary experience in* Bash, LabVIEW, HTML, MATLAB, & Java

### Operating Systems

- Linux
- Windows
- Mac OS

### Areas of Expertise and/or Unique Experience within Astronomy

- Fundamental Parameters of Late-Type Stars
- The Solar Neighborhood (especially within 25 parsecs)
- Young stars, subdwarfs, and unresolved binaries
- Photometry and astrometry
  - observations, data reduction, and utilization within research
- Solo observing runs, 7 nights+, with no telescope operator or assistant

- Telescope Management (see SMARTS Graduate Fellowship)
- Project Management
  - multi-year all-sky observational program for hundreds of stars

## Observing Experience

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- **WIYN 0.9m Telescope (32 nights)** **0.9m**  
*Kitt Peak National Observatory (KPNO)*  
 (WIYN=Wisconsin, Indiana, Yale, NOAO)

- ◇ Absolute Photometry of Nearby Red Dwarfs
  - Project: PhD Thesis — Fundamental Parameter Determination of Nearby Red Dwarfs
- ◇ Relative Photometry of Potentially Variable Red Dwarfs (backup project)
- ◇ Time Granted via NOAO Observing Proposals — 29 nights (+3 via private communication)  
*2017B 14 nights | 2017A 5 nights (+3) | 2016B 7 nights*

- **SMARTS 0.9m Telescope (87 nights)** **0.9m**  
*Cerro Tololo Inter-American Observatory (CTIO)*  
 (SMARTS=Small and Moderate Aperture Research Telescope System)

*As the **SMARTS Graduate Fellow** I have helped schedule time, trained new observers from both our (during 2016A) and other institutions, updated the user's manual, and reduced several years worth of astrometric and photometric data for the RECONS team. Below is my observing experience at the SMARTS 0.9m at CTIO, most of which was done on solo 9- to 12-night observing runs.*

- ◇ Absolute Photometry of Nearby Red Dwarfs
  - Project: PhD Thesis — Fundamental Parameter Determination of Nearby Red Dwarfs
  - Time spent also on targets for the rest of the RECONS team and their various nearby star-related projects.
  - One night spent on several galaxies and asteroids for other graduate student projects
- ◇ Astrometry of Nearby Stars
  - Project: CTIOPI program — The RECONS 25 Parsec Database and other related projects
- ◇ Relative Photometry of Potentially Variable Red Dwarfs (backup project)
- ◇ Observing Time (purchased by RECONS team) — 87 nights (8 nights gifted by Dr. Bob Wing)  
*2017A 22 nights | 2016B 12 nights | 2016A 9 nights | 2015B 12 nights*  
*2015A 10 nights | 2014B 12 nights | 2014A 10 nights*

- **ARCSAT (70 nights)** **0.5m**  
*Apache Point Observatory (APO)*  
 (ARCSAT=Astrophysical Research Consortium Small Aperture Telescope)

- ◇ Absolute Photometry of Nearby Red Dwarfs
  - Project: PhD Thesis — Fundamental Parameter Determination of Nearby Red Dwarfs
- ◇ Relative Photometry of Potentially Variable Red Dwarfs (backup project)

- ◇ Time Successfully Observed — 30 nights  
(good weather, no maintenance issues)
- ◇ Time Granted via ARC Observing Proposals — 70 nights  
(semesters reported rather than quarters due to quarter inconsistency)
  - 2016B 7 nights | 2016A 11 nights | 2015B 14 nights | 2015A 14 nights
  - 2014B 14 nights | 2014A 10 nights

**Astrophysical Research Consortium 3.5-meter Telescope (2 half-nights) 3.5m**

- *Apache Point Observatory (APO)*
  - ◇ Echelle Spectroscopy of Nearby Red Dwarfs
    - Project: PhD Thesis — Fundamental Parameter Determination of Nearby Red Dwarfs
  - ◇ Time Granted via ARC Observing Proposals — 2 half-nights during 2016B, applied for by Tiffany Clements  
(Observations during the January, 2017 half-night with good observing conditions were led by PhD student Tiffany Clements.)

**Gemini South Telescope (1 night) 8m**

- *Gemini Observatory, Cerro Pachon, Chile*
  - ◇ Speckle Imaging of Nearby Stars
    - Project: Multiplicity fractions of K dwarfs and M dwarfs, other team projects
  - ◇ Helped with 1 night of observations in June, 2016 as a guest of the DSSI instrument team

**Hale Telescope (3 nights) 200in (5.1m)**

- *Palomar Observatory*
  - ◇ My first observing experience, thanks to graduate student Phil Muirhead, involved 3 nights of spectroscopy and interferometry in February, 2011.

## Teaching Experience

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**Mentor Summer 2016**

- *Georgia State University, Atlanta, GA*  
Guided a first year undergraduate through his first experience in research and computer programming. He undertook a small project to analyze how/whether the WISE photometry data of several hundred stars were being affected by neighboring sources. The project exposed him to some of the basic, yet fundamental, ways of looking at and working with stellar data; he downloaded and worked with datasets from VizieR and manually examined and analyzed images using Aladin. He compiled a table of data containing all of the relevant stellar parameters, made notes about stars of particular interest or complexity, and created plots using Python that revealed the answer of how data for several hundred of our stars are influenced by their neighbors. I chose Python as his first programming language because not only is it growing in popularity among the astronomical community, but also among technical fields beyond academia. He learned and gained experience in basic data analysis, how to use several prominent online astronomy tools, the basics of coding in Python, and how to write up results, which he presented in a one-page document.

**Graduate Teaching Assistant Fall 2012 - Spring 2016**

- *Georgia State University, Atlanta, GA*

Taught up to three (varying by semester) 2-hour introductory astronomy laboratory sections per week. Responsibilities included grading, a short lecture at the start of each class, guiding students through each lab, and hosting an on-campus opportunity to use a telescope and experience observing.

Astronomy 1010 Laboratory Class	10 Semesters	15 Labs
Astronomy 1020 Laboratory Class	2 Semesters	4 Labs

## Outreach

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- Hard Labor Creek Observatory Open House** **2012-2018**

○ *Hard Labor Creek State Park, Rutledge, GA* *organized by Georgia State University*  
 Opened the Hard Labor Creek Observatory for public viewing of several astronomical objects on a variety of telescopes. Those who attend get the benefit of dark skies and 5+ astronomers to demonstrate how each telescope works and discuss what is being observed.

Volunteer: 12 Nights                      Graduate Student Contact: 2 Nights
  
- Total Solar Eclipse Viewing Party** **August 21, 2017**

○ *Rabun Gap-Nacoochee School, Rabun Gap, GA* *organized in part by Georgia State University*

  - Co-scripted, narrated and performed in the ~10 minute introduction and safety video shown to all attendees.
  - Prepared materials (drilled holes in tubes, etc.) for the children's pinhole camera activity at the event.
  - Volunteered at the event — setup and clean up, helping children build a pinhole camera, manning an H $\alpha$  telescope, and talking to attendees.
  
- Girl Scouts Astronomy Workshop** **2013-2017 (8 events)**

○ *Georgia State University, Atlanta, GA* *organized by Prof. Misty Bentz*

  - A workshop exploring the Sun, the solar system and different types of light.
  - Led a craft where the girls built a spectroscope using materials that could be found at home and a small diffraction grating. The girls also explored using their spectroscopes on various light sources including an incandescent light bulb and spectrum tubes containing neon, hydrogen, and several other elements.
  - Led a craft creating a filter wheel using some plates and red, yellow, and blue transparent paper. The girls then got to look at a Lite-Brite to see how the filters changed what they could see.
  
- Creative Lessons in Astronomy and Space Science (CLASS) Contest** **May 15, 2015**

○ *IAU Symposium 314: Young Stars & Planets Near the Sun, hosted by GSU*  
 Assisted middle school students in a workshop exploring astronomy and rocket launches using the Kerbal Space Program.
  
- Girl Scouts Sky Badge Workshop** **March 2, 2013**

○ *Hard Labor Creek State Park, Rutledge, GA* *organized by Prof. Misty Bentz*  
 Introduced high school aged Girl Scouts to the local Hard Labor Creek Observatory and its telescopes. Explored how to use a sky chart, tell which way is north, and other skills. Answered any questions the girls had about astronomy or related topics.
  
- Science Olympiad "Reach for the Stars" Activity** **February 16, 2013**

○ *Georgia State University, Atlanta, GA* *organized by Dr. John Wilson*  
 A regional competition between middle schools. Provided a fun way to test material the students had studied for the event, according to the "Reach for the Stars" theme.

## Expand Your Horizons

### ○ Cornell University, Ithaca, NY

Utilized fun physics-related activities in an effort to impart an interest in science on middle school aged girls. The students constructed a small aluminum foil boat of their own design and tested each one to see which boat (and which design) would hold the most pennies before sinking in water.

## Publications

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1. Emily A. Gilbert, Thomas Barclay, Joshua E. Schlieder, ..., **Michele L. Silverstein**, ..., **2020**, *The First Habitable Zone Earth-sized Planet from TESS. I: Validation of the TOI-700 System*, arXiv:2001.00952 (AAS Journals submitted)
2. Jennifer G. Winters, Todd J. Henry, Wei-Chun Jao, John P. Subasavage, Joseph P. Chatelain, Ken Slatten, Adric R. Riedel, **Michele L. Silverstein**, and Matthew J. Payne, **2019**, *The Solar Neighborhood XLV. The Stellar Multiplicity Rate of M Dwarfs within 25 pc*, AJ, 157, 216W
3. Roland Vanderspek, Chelsea X. Huang, Andrew Vanderburg, George R. Ricker, ..., **Michele L. Silverstein**, ..., **2019**, *The TESS Search for Exoplanets in the Solar Neighborhood: An Ultra-Short-Period Super-Earth Orbiting LHS 3844*, ApJL, 871, L24
4. Todd J. Henry, Wei-Chun Jao, Jennifer G. Winters, Sergio B. Dieterich, Charlie T. Finch, Philip A. Ianna, Adric R. Riedel, **Michele L. Silverstein**, John P. Subasavage, Eliot Halley Vrijmoet, **2018**, *The Solar Neighborhood XLIV: RECONS Discoveries within 10 parsecs*, AJ, 155 265
5. Adric R. Riedel, **Michele L. Silverstein**, Todd J. Henry, Wei-Chun Jao, Jennifer G. Winters, John P. Subasavage, Lison Malo, Nigel C. Hambly, **2018**, *The Solar Neighborhood. XLIII: Discovery of New Nearby Stars with  $\mu < 0.''18 \text{ yr}^{-1}$  (TINYMO sample)*, AJ, 156 49
6. Wei-Chun Jao, Todd J. Henry, Jennifer G. Winters, John P. Subasavage, Adric R. Riedel, **Michele L. Silverstein**, Philip A. Ianna, **2017**, *The Solar Neighborhood. XLII. Parallax Results from the CTIOPI 0.9 m Program—Identifying New Nearby Subdwarfs Using Tangential Velocities and Locations on the H-R Diagram*, ApJ, 154 191
7. Tiffany D. Clements, Todd J. Henry, Altonio D. Hosey, Wei-Chun Jao, **Michele L. Silverstein**, Jennifer G. Winters, Sergio B. Dieterich, and Adric R. Riedel, **2017**, *The Solar Neighborhood. XLI. A Study of the Wide Main Sequence for M Dwarfs — Long-Term Photometric Variability*, ApJ, 154 124
8. M. Simon, Joshua E. Schlieder, Ana-Maria Constantin, and **Michele Silverstein**, **2012**, *WISE Detection of the Circumstellar Disk Associated with 2MASS J0820-8003 in the  $\eta$  Cha Cluster*, ApJ, 751 114

## Presentations

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### Talks, Seminars, and Colloquia.....

#### ○ Sizing Up Red Dwarfs in the Solar Neighborhood (2019)

- ◇ Contributed Talk (5 min) — SEEC Symposium, NASA Goddard Space Flight Center, Nov. 2019
- ◇ Invited Talk (45 min) — Weekly Seminar Series, Carnegie Institution of Washington Department of Terrestrial Magnetism, Oct. 2019
- ◇ Contributed Talk (15 min) — Chesapeake Bay Area Exoplanet Meeting, University of Delaware, Sep.

2019

- ◇ Invited Talk (45 min) — Exoplanets Seminar Series, NASA Goddard Space Flight Center, Jun. 2019
- ◇ Dissertation Talk (20 min) — 233rd Meeting of the American Astronomical Society, Seattle, WA, Jan. 2019, Presentation 420.04D
- Hints of Planet Formation in Nearby Young Moving Groups, Michele Silverstein, Ana-Maria Constantin, Michal Simon, 2011, Stony Brook University REU Physics & Astronomy Research Symposium, 2

## Posters.....

- Discovery and Characterization of Two Earth-Sized TESS Planets Orbiting a Bright, Nearby M2 Dwarf  
Michele L. Silverstein, Joshua E. Schlieder, Thomas Barclay, ... **2020**, 235th Meeting of the American Astronomical Society Poster Session, Poster #174.25
- Sizing Up Red Dwarfs in the Solar Neighborhood  
Michele L. Silverstein, Todd J. Henry, Sergio B. Dieterich, Wei-Chun Jao, Jennifer G. Winters, Tiffany D. Clements, Adric R. Riedel, Kenneth J. Slatten, **2019**,
  1. SEEC Symposium at NASA Goddard Space Flight Center
  2. Early Career Scientist Forum at NASA Goddard Space Flight Center, Poster P-25
- Sizing Up Southern Red Dwarfs in the Solar Neighborhood: First Results  
Michele L. Silverstein, Todd J. Henry, Wei-Chun Jao, Sergio B. Dieterich, Jennifer G. Winters, Adric R. Riedel, Kenneth J. Slatten, **2018**, Cool Stars 20 Poster Session, Poster #286
- Sizing Up Southern Red Dwarfs in the Solar Neighborhood  
Michele L. Silverstein, Todd J. Henry, Wei-Chun Jao, Adric R. Riedel, Sergio B. Dieterich, Jennifer G. Winters, Kenneth J. Slatten, Tiffany D. Clements, R. Andrew Sevrinsky, **2017**, 229th Meeting of the American Astronomical Society Poster Session, Poster #154.12
- Fundamental Parameters of Nearby Southern Red Dwarfs: Stellar Radius as an Indicator of Age  
Michele L. Silverstein, Todd J. Henry, Jennifer G. Winters, Wei-Chun Jao, Adric R. Riedel, Sergio B. Dieterich, R. Andrew Sevrinsky, **2016**, 227th Meeting of the American Astronomical Society Poster Session, Poster #145.05, Chambliss Astronomy Achievement Student Award Winner
- SIRENS: The Search for InfraRed Excesses around Nearby Stars  
Michele L. Silverstein, Todd J. Henry, Wei-Chun Jao, Jennifer G. Winters, **2015**, IAU Symposium 314: Young Stars & Planets Near the Sun, Poster P1.16
- Circumstellar Environments of Southern M Dwarfs in the Solar Neighborhood,  
Michele L. Silverstein, Todd J. Henry, Wei-Chun Jao, and Jennifer G. Winters, **2015**, 225th Meeting of the American Astronomical Society Poster Session, Poster #138.03
- Completion of a Martin-Puplett Interferometer for Terahertz Frequency Characterization of Materials and Passive Components  
Michele Silverstein, Negar Ehsan, **2012**, Goddard Space Flight Center Summer Intern Poster Session

## Grants and Awards

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- **NASA Postdoctoral Program Fellowship** **August 2019**  
*NASA Postdoctoral Program* *Two Years of Funding as a Postdoctoral Fellow*
- **Sigma Xi Grant-in-Aid of Research** **December, 2016**  
*Sigma Xi, The Scientific Research Society* *\$2500 for Travel to CTIO*
- **Chambliss Astronomy Achievement Student Award** **January, 2016**  
*229<sup>th</sup> American Astronomical Society Meeting* *Personalized Medal*

- **Outstanding Second Year Graduate Student Award in Astronomy**  
Georgia State University

**April, 2015**  
\$100 + Certificate

*Observing proposals listed under Observing Experience*

## Languages

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German  
*some proficiency*

Mandarin Chinese  
*minimal proficiency*

Spanish  
*minimal proficiency*

## Martial Arts

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Taekwondo

blue (6th) belt — both ITF & WTF systems

Filipino Kali

orange (3rd) belt — World Modern Arnis Alliance (WMAA) member

Boxing

moderate experience

Additional Experience:

Muay Thai, Brazilian Jiu Jitsu, Jeet Kune Do, Tai Chi, Wing Chun, Aikido, Wushu, Hapkido

## Mindfulness Meditation

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*Mindfulness-Based Stress Reduction (MBSR) Course* — An 8 week course taught by Lineliz Vassallo that met for 2.5 hours once per week. Covered the basics of mindfulness and mindfulness meditation.

*Mindful Ambassador Program* — A weekly 1-hour course for graduates of the MBSR program to learn how to introduce mindfulness to those who are interested and lead meditations and discussions.