Maria T. Patterson Last Update: July 31, 2017

Contact Information

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Education

New Mexico State University (NMSU) Las Cruces, NM
Ph.D., with Honors, Astronomy May 2013
- Thesis Title: *Properties of Star Formation and the Interstellar Medium in Galaxy Outskirts*

M.S., with Honors, Astronomy May 2011

University of Chicago Chicago, IL
B.A., with Honors, Physics with Specialization in Astrophysics June 2007
- Thesis Title: *Direct Cherenkov Detection with the Very Energetic Radiation Imaging Telescope Array System (VERITAS)*

Research and Work Appointments

Department of Astronomy, University of Washington Seattle, WA
Research Scientist, LSST Data Management group August 2016 - present
- Building the next generation algorithms and software tools for the Large Synoptic Survey Telescope (LSST).
- Designing and benchmarking a Python-based streaming data ecosystem for astronomical alert distribution and processing using Kafka, Avro, and Spark.

Center for Data Intensive Science, University of Chicago Chicago, IL
Director of the Open Science Data Cloud March 2014 - July 2016
- Scientific Lead for the Open Science Data Cloud (OSDC), a petabyte scale community science cloud.
- Technical Lead for the Open Commons Consortium's (OCC) cooperative research and development partnership with NOAA through the NOAA Big Data Project, coordinating the establishment of a community science cloud of environmental data for the academic and research community.
- Planned and organized OSDC NSF Partnerships for International Research and Education (PIRE) data intensive science and computing fellowship and workshop program for graduate students.
- Directly supervised data science projects for three undergraduate students.

Research Professional September 2013 - July 2016
- Developed computational algorithms for detecting spatial patterns in geo-coded medical records.
- Developed and maintained an analytic pipeline of daily automated machine learning algorithms for cloud processing and analysis of NASA satellite data using Python, Hadoop, Accumulo, and Storm.
- Modeled the distribution of data stored on distributed file storage systems using Monte Carlo methods to analyze hardware performance issues.

Royal Observatory / School of Informatics, University of Edinburgh Edinburgh, Scotland
Open Science Data Cloud (OSDC) NSF PIRE Summer Fellow June - August 2013
- Developed a Python tool to test query speeds and compare system utilization in row-oriented vs. column-oriented database implementations of the astronomical database for the VISTA Variables in the Via Lactea (VVV) Survey.

Sapling Learning Inc., Macmillan (Remote/Online)
Astronomy Content Author and Reviewer April 2013 - November 2013
- Created questions and solutions of varying difficulty to test students' understanding of astronomical concepts in an online interactive system for higher education course homework.
- Reviewed and edited questions and solutions written by others for subject matter content and clarity and for proper software module functionality.

Department of Astronomy, New Mexico State University Las Cruces, NM
Graduate Research Assistant August 2007 - May 2013
- Modeled the density and rotation of gas in galaxies to identify anomalous features in HALOGAS (Hydrogen Accretion in LOcal GAlaxieS) Survey observation data.

- Collected and analyzed deep, wide-field optical images of galaxies to search for faint signatures of galaxy mergers and young star formation as Principal Investigator of two accepted observing proposals to the National Optical Astronomy Observatory.
- Organized a 5-day scientific workshop of presentations, breakout sessions, and evening activities for the HALOGAS collaboration of twenty internationally-based scientists.
- Reduced and analyzed spectroscopic data to study the abundances of metals in star forming regions.

Head Teaching Assistant January 2010 - May 2010

- Prepared laboratory equipment for all teaching assistants, led weekly meetings to plan exercises, and operated the campus observatory telescopes for students twice weekly.

Laboratory Instructor August 2007 - December 2009

- Taught laboratory component to an undergraduate Astronomy course for non-majors and operated campus observatory telescopes.

Publications and Research Presentations

Paper Publications

HALOGAS Observations of NGC 4559: Anomalous and Extraplanar HI and its Relation to Star Formation
C. J. Vargas, G. Heald, R.A.M. Walterbos, F.Fraternali, **M.T. Patterson**, R.J. Rand, G.I.G. Jzsa, G. Gentile, P. Serra
The Astrophysical Journal, April 2017, Volume 839, Issue 2

The Matsu Wheel: a reanalysis framework for Earth satellite imagery in data commons
M.T. Patterson, N. Anderson, C. Bennett, J. Bruggemann, R.L. Grossman, M. Handy, V. Ly, D.J. Mandl, S. Pederson, J. Pivarski, R. Powell, J. Spring, W. Wells, J. Xia
International Journal of Data Science and Analytics, 2017

Hydrological modeling and capacity building in the Republic of Namibia
R.A. Clark III, Z.L. Flamig, H. Vergara, Y. Hong, J.J. Gourley, D.J. Mandl, S. Frye, M. Handy, **M.T. Patterson**
Bulletin of the American Meteorological Society, December 2016

The Case for Data Commons: Towards Data Science as a Service
R.L. Grossman, A. Heath, M. Murphy, **M.T. Patterson**, W. Wells
Computing in Science Engineering special issue on Science as a Service, September 2016, Volume 18, Issue 5, pages 10-20

The Matsu Wheel: A Cloud-based Framework for Efficient Analysis and Reanalysis of Earth Satellite Imagery
M.T. Patterson, N. Anderson, C. Bennett, J. Bruggemann, R.L. Grossman, M. Handy, V. Ly, D.J. Mandl, S. Pederson, J. Pivarski, R. Powell, J. Spring, W. Wells, J. Xia
IEEE Second International Conference on Big Data Computing Service and Applications (BigDataService), March 2016, pages 155-165

HALOGAS observations of NGC 4414: fountains, interaction, and ram pressure
W.J.G. de Blok, G.I.G. Jozsa, **M.T. Patterson**, G. Gentile, G.H. Heald, E. Jutte, P. Kamphuis, R.J. Rand, P. Serra, R.A.M. Walterbos
Astronomy & Astrophysics, June 2014, Volume 566, id.A80, 16 pp.

HALOGAS observations of NGC 5023 and UGC 2082: Modeling of non-cylindrically symmetric gas distributions in edge-on galaxies
P. Kamphuis, R.J. Rand, G.I.G. Jozsa, L.K. Zschaechner, G.H. Heald, **M.T. Patterson**, G. Gentile, R.A.M. Walterbos, P. Serra, W.J.G. de Blok
Monthly Notices of the Royal Astronomical Society, September 2013, Volume 434, Issue 3, pages 2069-2093

HALOGAS: Extraplanar gas in NGC 3198
G. Gentile, G.I.G. Jozsa, P. Serra, G.H. Heald, W.J.G. de Blok, F. Fraternali, **M.T. Patterson**, R.A.M. Walterbos, T. Oosterloo
Astronomy & Astrophysics, June 2013, Volume 554, id.A125, 10 pp.

An oxygen abundance gradient into the outer disc of M81
M.T. Patterson, R.A.M. Walterbos, R.C. Kennicutt, C. Chiappini, D.A. Thilker
Monthly Notices of the Royal Astronomical Society, May 2012, Volume 422, Issue 1, pages 401-419

Oral Presentations

Building a community fountain around your data stream
July 2017: PyData Seattle Conference, Microsoft Campus, Redmond, WA

Big Data vs The Scientist: Or how I learned to stop worrying and love the cloud
June 2016: ACM Chicago Meetup, Chicago, IL

Cloud-based Scanning Analytics for Large Volumes of Hyperspectral Data
June 2014: HyspIRI Product Symposium, NASA Goddard Space Flight Center, Greenbelt, MD

Reproducible Research and Collaborative Tools with the Open Science Data Cloud
June 2014: OSDC PIRE Big Data and Cloud Computing Workshop, University of Amsterdam, Science Park, Netherlands

Gaseous Halos and Outer Disk Star Formation in the HALOGAS Survey: Results for NGC 5055
July 2013: Royal Observatory Edinburgh, Coffee Talk, Edinburgh, Scotland

Evolutionary Processes in Nearby Spiral Galaxies: Characterizing the Metallicities, Star Formation, and Accretion in Galaxy Outskirts
January 2013: 221st Meeting of the American Astronomical Society, Long Beach, CA

Early Results from the HALOGAS Survey: HI Observations of NGC 5055
April 2012: Tully-Fisher at 35: Global Properties of HI in Galaxies Workshop, NRAO, Green Bank, WV

The HALOGAS Survey: HI Observations and Modeling of NGC 5055 and NGC 4258
October 2011: 27th Annual New Mexico Symposium, Socorro, NM

Poster Presentations

Key Lessons in Building Data Commons: The Open Science Data Cloud Ecosystem
December 2015: 2015 American Geophysical Union Fall Meeting, San Francisco, CA
M.T. Patterson, M. Murphy, R.L. Grossman, A. Heath, W. Wells

Counter-Rotating and Lagging Extra-planar HI in NGC 4559
January 2015: 225th Meeting of the American Astronomical Society, Seattle, WA
C.J. Vargas, G. Heald, R.A.M. Walterbos, F. Fraternali, **M.T. Patterson**

Deep HI Observations of NGC 5055 from the HALOGAS Survey
May 2012: STScI May Symposium: Gas Flows in Galaxies, Baltimore, MD
M.T. Patterson, the HALOGAS Team

HI Streams and Spurs in HALOGAS Observations of NGC 5055
January 2012: 219th Meeting of the American Astronomical Society, Austin, TX
M.T. Patterson, R.A.M. Walterbos, G. Heald, G. Jozsa, G. Gentile, D. Thilker

The HALOGAS Project: HI Observations of NGC 5055 and NGC 4258
June 2011: Gas in Galaxies: From Molecular Clouds to Cosmic Web, Kloster Seeon, Germany
M.T. Patterson, the HALOGAS Team

The HALOGAS Project: HI Observations of NGC 5055
January 2011: 217th Meeting of the American Astronomical Society, Seattle, WA
M.T. Patterson, R.A.M. Walterbos, G. Heald, G. Jozsa, L. Zschaechner, R. Rand, D. Thilker

HII Regions in the Outer Disk and Tidal Arms of M81
January 2010: 215th Meeting of the American Astronomical Society, Washington D.C.

January 2010: 25th Annual New Mexico Symposium, Socorro, NM
M.T. Patterson, R.A.M. Walterbos, D.A. Thilker, R.C. Kennicutt, C. Chiappini

Extraplanar Gas Extent of Edge-on Galaxies: A Comparison of the Galaxies NGC 4244 and NGC 891
June 2009: Galaxy Metabolism Conference, Sydney, Australia
M.T. Patterson, R.A.M. Walterbos

Interstellar Gas and Massive Stars in External Galaxies: Initial Results for the Galaxies M33 and NGC 4517
April 2009: NMSU Graduate Research and Arts Symposium, Las Cruces, NM
M.T. Patterson, R.A.M. Walterbos

Multi-long-slit Spectroscopy for Kinematic Studies. I. Implementation and Demonstration
January 2008: 211th Meeting of the American Astronomical Society, Austin, TX
R.A.M. Walterbos, J. Choi, S. Cisneros, **M.T. Patterson**, C. Wu

Multi-long-slit Spectroscopy for Kinematic Studies. II. Initial Results for the Edge-On Galaxies NGC 891 and NGC 4244
January 2008: 211th Meeting of the American Astronomical Society, Austin, TX
J. Choi, S. Cisneros, C. Wu, **M.T. Patterson**, R.A.M. Walterbos

Successful Proposals as Principal Investigator

"Continuing Observations of Stellar Streams and Star Formation in the Outskirts of HALOGAS Spiral Galaxies"
- Telescope observing proposal to National Optical Astronomy Observatory (NOAO) Proposal ID: 2012A-0185
- 4 full nights granted on the Kitt Peak National Observatory (KPNO) Mayall 4-meter Telescope Mosaic 1.1 Wide Field Imager

"Stellar Streams and Star Formation in the Outskirts of HALOGAS Spiral Galaxies"
- Telescope observing proposal to NOAO Proposal ID: 2011B-0355
- 4 full nights granted on the KPNO Mayall 4-meter Telescope Mosaic 1.1 Wide Field Imager

"Star Formation and Chemical Abundances in the Outer Disks and Haloes of Galaxies"
- New Mexico Space Grant Consortium Graduate Research Fellowships 2010
- $10,000 over two semesters

"Interstellar Gas and Massive Stars in External Galaxies"
- New Mexico Space Grant Consortium Graduate Research Fellowships 2009
- $5,000 over two semesters

Awards and Grants

Academic Fellowships and Awards
- PepsiCo and 21st Century Fox's "Search for Hidden Figures" Winner — January 2017
- Outstanding Paper Award, BigDataService Conference — March 2016
- Insight Data Science Program Fellowship (declined) — Summer 2016
- Open Science Data Cloud NSF PIRE Fellowship — Summer 2013
- OSDC-PIRE Challenge, 3rd Place Paper — June 2013
- Murrell Award for Professional Development and Research Accomplishment — 2013
- NMSU Outstanding Graduate Assistant Award (awarded twice) — 2008-2009 & 2012-2013
- Pegasus Award for Excellence in Teaching — 2010
- New Mexico Higher Education Department Fellowship — 2008 - 2011
- NMSU Merit-Based Enhancement Fellowship — 2009 - 2010

Conference and Travel Grants
- *Grace Hopper Celebration of Women in Computing* Scholar — Phoenix, AZ, 2014
- *NM Celebration of Women in Computing* Conference Scholarship — Las Cruces, NM, 2012
- NMSU College of Arts and Sciences Graduate Student Travel Award
  Gas Flows in Galaxies May Symposium — Baltimore, MD, 2012

- American Astronomical Society International Travel Grant
  HALOGAS Collaboration Workshop Bochum, Germany, 2011
- *Women in Astronomy and Space Science* Conference Travel Grant College Park, MD, 2009
- *The Evolution of Galaxies Through the Neutral Hydrogen Window* Conference Travel Grant
  Arecibo Observatory Puerto Rico, 2008

Professional Development

Technological Conferences and Workshops

- PyData Seattle (diversity committee), Redmond, WA 2017
- Richard Tapia Celebration of Diversity in Computing (big data panelist), Austin, TX, 2016
- Supercomputing, Austin, TX, 2015 (data commons panelist); New Orleans, LA, 2014 (scientific data panelist)
- OSDC Partnerships for International Research and Education, Big Data and Cloud Computing Workshops, University of Amsterdam, June 8−12, 2015 (lecturer); June 16−20, 2014 (lecturer); University of Edinburgh, June 17−21, 2013 (participant)
- Grace Hopper Celebration of Women in Computing, Phoenix, AZ, October 7−10, 2014
- Summer School in Statistics for Astronomers IX, Penn State, June 3−7, 2013
- New Mexico Celebration of Women in Computing, Las Cruces, NM, November 8−9, 2012

Extra-Curriculars and Service

Member, Committee on the Status of Women in Astronomy June 2017 - June 2020
Editor, AASWomen Newsletter August 2016 - present
Competitions participant, Kaggle data science competitions kaggle.com/mtpatter
Distance runner, 16 races including 1 Marathon and 6 Half Marathons runningaverage.com
Contributer, Open Science Café blog opensciencecafe.org

University of Chicago Chicago IL

Volunteer, UChicago Alumni Schools Committee August 2009 - present
- Interviewing prospective undergraduates for possible admission to the University of Chicago.

Committee Member, UChicago Class of 2007 Council August 2007 - present
- Responsible for planning class reunions, raising funds for the University, and acting as a liason for the University to alumnae.

Panel Moderator, Taking the Next Step January 10, 2015
- Moderator of Research Sciences career panel at College Programming Office event for sophomores and juniors.

Treasurer, Samahan Filipino Cultural Association August 2005 - May 2007
- Maintained account records, processed reimbursements, and prepared annual allocations budget proposal for Student Government Fund Committee approval

New Mexico State University Las Cruces, NM

Colloquium Committee Member August 2011 - May 2013
- Organized scheduling of visiting colloquium speakers to the Astronomy Department.

Astronomy Team Captain, ACS Relay for Life December 2010 - April 2011
- Led Astronomy Team to raise over $2000 for American Cancer Society.

Committee Member, NMSU Relay for Life October 2008 - April 2009
- Organized NMSU's American Cancer Society all-night walk-a-thon fundraiser.

Secretary, NMSU Astronomy GSO August 2008 - May 2009
- Responsible for re-chartering Astronomy Graduate Student Organization.

Collaborators

Dr. Robert Grossman - (Advisor) University of Chicago, Chicago, IL
Dr. Daniel Mandl - NASA Goddard Space Flight Center, Greenbelt, MD
Dr. Rene Walterbos - (Thesis Advisor) New Mexico State University, Las Cruces, NM
Dr. George Heald - HALOGAS Principal Investigator, ASTRON, Dwingeloo, Netherlands
Dr. David Thilker - Johns Hopkins University, Baltimore, MD
The HALOGAS Collaboration