

# Mark Giovinazzi

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## CAREER OBJECTIVE

Position in academia or national lab focusing on the physical characterization of exoplanets and their solar systems.

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## EDUCATION

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| <b>University of Pennsylvania</b>  | Philadelphia, PA                         |
| • <i>National Science Foundation Graduate Research Fellow</i>                                | <i>June 2018 - Present</i>               |
| <i>Master of Science; Pursuing PhD in Physics &amp; Astronomy</i>                            | <i>Anticipated Completion: May, 2024</i> |
| <b>Drexel University</b>   | Philadelphia, PA                         |
| • <i>Bachelor of Science in Physics; Concentration in Astrophysics; Minor in Mathematics</i> | <i>September 2013 - June 2018</i>        |
| <i>Overall GPA: 3.67; Major GPA: 3.74</i>  | <i>Cum Laude and with Honors</i>         |

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## RESEARCH EXPERIENCE

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| <b>Graduate Research Assistant, NSF Graduate Research Fellow</b>   | Philadelphia, PA                   |
| • <i>Advisor: Professor Cullen Blake, University of Pennsylvania</i>   | <i>June 2018 - Present</i>         |
| <ul style="list-style-type: none"><li>◦ Use Bayesian inference and MCMC analyses to infer orbital solutions of planetary and binary star systems</li><li>◦ Access and employ large datasets from archival sky surveys like Gaia, Hipparcos, 2MASS, and APOGEE</li><li>◦ Member of NEID (NN-explore Exoplanet Investigations with Doppler spectroscopy) science team</li><li>◦ Work with TESS and Kepler lightcurves to identify candidate systems for telescope allocation proposals</li><li>◦ Lead scientist on reanalysis of KELT-24 planetary system</li><li>◦ Created mass-magnitude relation with <math>\sim 10\%</math> internal precision applicable to 30+ million stars in the Gaia catalog</li><li>◦ Simulated outer solar system objects to promote optimal observing strategies for future GO programs</li><li>◦ Led analysis on proprietary RV data from MINERVA telescope array to probe HD 217107b for precession</li><li>◦ Developed per-pixel nonlinearity map for NEID's 10k x 10k CCD capable of removing instrumental noise</li><li>◦ Created visualization for the NEID CCD's unique dither-clocking method</li><li>◦ Successful observing proposal for NEID/WIYN 2020B and 2023B semesters</li></ul> |                                    |
| <b>Senior Research: Simulating Planetary Systems within Star Clusters</b>  | Philadelphia, PA                   |
| • <i>Advisor: Professor Steve McMillan, Drexel University</i>  | <i>September 2017 - June 2018</i>  |
| <ul style="list-style-type: none"><li>◦ Simulated 20+ million stellar systems with 70,000+ planets to quantify long-term stability of planetary systems within star clusters using the Astrophysical Multipurpose Software Environment (AMUSE)</li><li>◦ Studied evolution of planetary orbital parameters in star clusters over billions of years to assess the sustainability of planets in habitable zones of their stars</li></ul>   |                                    |
| <b>Technical Research Specialist</b>   | Cherry Hill, NJ                    |
| • <i>Lockheed Martin Advanced Technology Laboratories, Spectrum Systems Laboratory</i>   | <i>March 2017 - September 2017</i> |
| <ul style="list-style-type: none"><li>◦ Led multiple branch-wide internal research and development programs</li><li>◦ Conducted radar and Digital Radio Frequency Memory (DRFM) experiments, and created machine learning algorithm to differentiate between true and artificial returns to an accuracy <math>&gt; 99\%</math></li><li>◦ Developed efficient and user-friendly signal processing programs in Python to analyze large datasets from both cabled and antenna collections</li><li>◦ Utilized deep learning techniques with Keras on synthesized data to detect low probability of detection waveforms 1,000,000 times weaker than a noise floor</li><li>◦ Projects required hardware/electronic instrumentation using cables, amplifiers, attenuators, antennas and Universal Software Radio Peripherals (USRP)</li></ul>   |                                    |

- **Research Student: A Search for Point Sources in IceCube Neutrino Data** Philadelphia, PA  
*Advisor: Professor Naoko Kurahashi-Neilson, Drexel University* January 2016 - March 2017
  - Implemented novel angular-dependent analysis in attempt to uncover the first extrasolar neutrino point source
  - Performed statistical analysis using Python on 100+ million events detected from the IceCube Neutrino Observatory
  - Parallelized my work to decrease run-time by factor of 50,000 compared to previous analyses
  - Collaborated with scientists internationally working on the IceCube project
- **Research Student: Star Camera Baffles for BLAST-TNG** Philadelphia, PA  
*Professor Mark Devlin, University of Pennsylvania* January 2015 - March 2016
  - Designed (in Solidworks), ordered parts for, built, tested, and integrated star camera baffles into the Balloon-borne Large Aperture Submillimeter Telescope - The Next Generation (BLAST-TNG) in order to shield the project's star cameras from unwanted light
  - Improved upon previous experiment's star camera baffles by making mine 40% longer and 40% lighter
  - Wrote computer program in Python to optimize my baffle design, ensuring that 100% of unwanted light would be deterred from star cameras
  - Cut, perforated, and wrapped the experiment's  $\sim 2\text{m}^3$  cryostat with multilayer insulation; assisted in opening and closing the cryostat on multiple occasions
  - Put together flight cables, and supervised, designed and oversaw the assembly of various structural components for BLAST-TNG's gondola
- **STAR Scholar: The Formation and Assembly of Star Clusters** Philadelphia, PA  
*Advisor: Professor Steve McMillan, Drexel University* June 2014 - March 2015
  - Simulated evolution of 1,000,000+ stellar systems to study how various initial conditions affect time of equilibration and mass segregation of clustered environments
  - Created models of star-forming regions using N-body integration schemes using Astrophysical Multipurpose Software Environment (AMUSE) in Python

## PUBLICATIONS (\* DENOTES 1ST-AUTHORED PAPER)

- \* "Extremely Precise Dynamical Masses in Seven High-acceleration Star Systems" (in prep.), **Giovinazzi, M. R.**, et al. 2023
- \* "Trials and Tribulations in the Reanalysis of KELT-24 b: a Case Study for the Importance of Stellar Modeling" (submitted), **Giovinazzi, M. R.**, Cale, B., Eastman, J. D., et al. 2023, *Astronomical Journal*
- \* "A Mass-Magnitude Relation for Low-mass Stars Based on Dynamical Measurements of Thousands of Binary Star Systems", **Giovinazzi, M. R.**, & Blake, C. H. 2022, *Astronomical Journal*
- \* "Enhancing Ground-based Observations of Trans-Neptunian Objects Using a Single-epoch Parallax Measurement from L2", **Giovinazzi, M. R.**, Blake, C. H., Bernardinelli, P. H., 2021, *Publications of the Astronomical Society of the Pacific*
- \* "The HD 217107 Planetary System: Twenty Years of Radial Velocity Measurements", **Giovinazzi, M. R.**, Blake, C. H., Eastman, J. D., et al., 2020, *Astronomische Nachrichten*
- "TYCHO: Realistically Simulating Exoplanets within Stellar Clusters I: Improving the Monte Carlo Approach, Joseph P. Glaser, Stephen L.W. McMillan, Aaron M. Geller, et al. (including **Giovinazzi, M. R.**), 2019, *The Astrophysical Journal*
- "Improving the Thermal Stability of a CCD Through Clocking", Blake, C. H., Li, D., Tufts, J., et al. (including **Giovinazzi, M. R.**), 2019, *Journal of Astronomical Telescopes, Instruments, and Systems*

## SELECTED TALKS

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- “Extremely Precise Stellar Masses in Highly-accelerating Star Systems”, Penn Internal Symposium, Philadelphia, PA, September 15, 2023
- “A Mass-Magnitude Relation for Low-mass Stars Based on Dynamical Measurements of Thousands of Binary Star Systems”, 2022 Sagan Exoplanet Summer Workshop, Pasadena, CA, July 25 - 29, 2022
- “The HD 217107 Planetary System: Twenty Years of Radial Velocity Measurements”, 2021 Sagan Exoplanet Summer Workshop, Pasadena, CA, July 19 - 23, 2021
- “The HD 217107 Planetary System: Twenty Years of Radial Velocity Measurements”, exoplanet-talks.org, Virtual Talk, January 12, 2021
- “The HD 217107 Planetary System: Twenty Years of Radial Velocity Measurements”, University of Pennsylvania Department of Physics & Astronomy Journal Club, Philadelphia, PA, October 2, 2020
- “The NEID Precision Radial Velocity Spectrometer: Characterization and Operation of the NEID CCD Detectors”, 2019 Sagan Exoplanet Summer Workshop, Pasadena, CA, July 15 - 19, 2019
- “Hunting for Exo-Earths using NEID”, University of Pennsylvania Department of Physics & Astronomy Journal Club, Philadelphia, PA, June 28, 2019
- “Simulating Planetary Systems within Star Clusters”, 2018 Sagan Exoplanet Summer Workshop, Pasadena, CA, July 23 - 28, 2018
- “Simulating Planetary Systems within Star Clusters”, Drexel University Senior Research Talk, Philadelphia, PA, May 31, 2018
- “A New Method for Finding Point Sources in High-Energy Neutrino Data”, American Physical Society April Meeting, Washington, DC, January 28 - 31, 2017
- “A New Method for Finding Point Sources in High-Energy Neutrino Data”, American Physical Society Mid-Atlantic Meeting, Newark, DE, October 15 - 16, 2016
- “A New Method for Finding Point Sources in High-Energy Neutrino Data”, University of Maryland IceCube collaboration meeting, College Park, MD, July 20, 2016

## SELECTED CONFERENCE PRESENTATIONS

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- “A Mass-Magnitude Relation for Low-mass Stars Based on Dynamical Measurements of Thousands of Binary Star Systems”, 2022 Sagan Exoplanet Summer Workshop, Pasadena, CA, July 25 - 29, 2022
- “The HD 217107 Planetary System: Twenty Years of Radial Velocity Measurements”, 2021 Sagan Exoplanet Summer Workshop, Pasadena, CA, July 19 - 23, 2021
- “The NEID Precision Radial Velocity Spectrometer: Characterization and Operation of the NEID CCD Detectors”, Giovinazzi, M. R., Blake, C. H., Li, D. et al., 2019 Sagan Exoplanet Summer Workshop, Pasadena, CA, July 15 - 19, 2019
- “The NEID Precision Radial Velocity Spectrometer: Characterization and Operation of the NEID CCD Detectors”, Giovinazzi, M. R., Blake, C. H., Li, D. et al., 223rd Meeting of the American Astronomical Society, Seattle, WA, January 6 - 10, 2019
- “Simulating Planetary Systems within Star Clusters”, Giovinazzi, M. R., McMillan, S. L. W., Glaser, J. P., 2018 Sagan Exoplanet Summer Workshop, Pasadena, CA, July 23 - 28, 2018
- “BLAST-TNG Star Camera Baffles”, Giovinazzi, M. R., Devlin, M., Quadrennial Physics Congress, San Francisco, CA, November 3 - 5, 2016

- “The Formation and Assembly of Star Clusters”, Giovinazzi, M. R., McMillan, S. L. W., Drexel University Kaczmarczik Lecture, Philadelphia, PA, October 22, 2014
- “The Formation and Assembly of Star Clusters”, Giovinazzi, M. R., McMillan, S. L. W., American Physical Society Mid-Atlantic Meeting, University Park, PA, October 3 - 5, 2014
- “The Formation and Assembly of Star Clusters”, Giovinazzi, M. R., McMillan, S. L. W., Drexel University STAR Poster Session, Philadelphia, PA, August 27, 2014

## PUBLIC SCIENCE TALKS

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- Astronomy on Tap
  - *Interactive talk curated to give adult members of the public an introduction to the radial velocity method*
    - “Planetary Hide ’n Seek: Searching for the Galaxy’s Most Elusive Worlds”, April 21, 2022 (20 participants)
- “The Exciting World of Exoplanets”
  - *Interactive talk curated to give members of the public (generally high-school and above) an introduction to exoplanets*
    - Virtual Talk / Santa Fe Stargazers, September 15, 2021 (20 participants)
    - Virtual Talk / Self-Advertised, June 10, 2021 (60 participants)
    - Franklin Township Public Library, Franklinville, NJ, July 25, 2019 (10 participants)
    - Delsea Regional High School, Franklinville, NJ, May 22, 2019 (50 participants)

## OPEN-SOURCE SOFTWARE

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- gorp\_masses
  - *GitHub-hosted Python package designed for users to estimate stellar masses according to Giovinazzi & Blake (2022)*

## RESEARCH EXPERTISE

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- **Observing Experience**
  - 7 nights observing on Fred Lawrence Whipple Observatory’s FAST spectrograph
- **Computer Skills**
  - **Programming Languages:** Python, Bash, SQL, MATLAB, LaTeX, C++, XML, R, Java
  - **Relevant Software:** Astrophysical MULTipurpose Software Environment (AMUSE), Keras: The Python Deep Learning Library, Solidworks, Word/Pages, Excel/Numbers, Powerpoint/Keynote/Beamer (LaTeX)
  - **Relevant Techniques:** Markov Chain Monte Carlo simulations, Machine Learning, Optimization of Big Data problems, N-body Simulations
  - **Environments:** Mac, Linux, Microsoft, Arduino
- **Hardware Experience:** soldering, cable-making, cryogenics, circuitry, operating telescopes/observatories
- **Foreign Language:** Italian (Conversant)

## HONORS/AWARDS

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- Zaccheus Danial Scholarship, University of Pennsylvania, 2023 - 2024
- 1st place, 3 Minute Thesis Competition, University of Pennsylvania, 2023
- Natural Sciences Category Winner, Penn Grad Talks, 2023
- Young Academic Tourette Scholarship, Kenny’s Dream Foundation, 2022
- UPenn President Gutmann Leadership Award (\$750), 2022
- UPenn School of Arts And Sciences Dean’s Travel Subvention (\$500), 2022
- Young Academic Tourette Scholarship, Kenny’s Dream Foundation, 2021
- NASA Group Achievement Award, NN-Explore NEID Radial Velocity Spectrograph, 2020

- Award Recipient, Women in Chemistry's STEM 60-second no-jargon POP Talk, 2019
- National Science Foundation Graduate Research Fellowship Recipient, 2019 - Present
- Graduate and Professional Student Assembly Travel Grant (\$575), University of Pennsylvania, Fall 2019
- Graduate and Professional Student Assembly Travel Grant (\$550), University of Pennsylvania, Spring 2019
- UPenn School of Arts And Sciences Dean's Travel Subvention (\$500), 2019
- Hector Tyndale Fellowship Endowment, University of Pennsylvania, 2019
- Graduate and Professional Student Assembly Travel Grant (\$600), University of Pennsylvania, 2018
- Office of Undergraduate Research Travel Grant (\$500), Drexel University, 2018
- Henry S. C. Chen Memorial Award for Physics, Drexel University, 2017
- Office of Undergraduate Research Travel Grant (\$500), Drexel University, 2017
- Society of Physics Students Travel Grant (\$300), Society of Physics Students National, 2017
- M. Russell Wehr Physics Award, Drexel University, 2016
- Supernova Undergraduate Research Fellow, Drexel University, 2015 - 2018
- STAR (Students Tackling Advanced Research) Scholar, Drexel University, Summer 2014
- Pennoni Honors College, Drexel University, 2013 - 2018

## LEADERSHIP

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- **Organizer, Philadelphia Astronomy on Tap** *April 2022 - Present*
  - Monthly event at Philadelphia pub that hosts local astronomers to give public science talks
  - Coordinate with speakers, make flyers, and advertise events
  - Emcee events each month, including speaker introductions, opening and closing remarks
- **Founder, Penn GRAD (Graduate Readiness and Application Development)** *August 2018 - Present*
  - Program designed to guide undergraduates through their path towards graduate physics programs, and to transition Seniors into graduate school
  - 2018: program supervised 8 upper division Physics majors at University of Pennsylvania with help from 8 Penn graduate students
  - 2019: program supervised 37 upper and lower division Physics majors between University of Pennsylvania and Drexel University with help from 17 Penn graduate students
  - 2020: program supervised 41 upper and lower division Physics majors between University of Pennsylvania, Drexel University and St. Joseph's University with help from 13 Penn graduate students
  - 2021: program supervised 35 upper and lower division Physics majors between University of Pennsylvania, Temple University and St. Joseph's University with help from 10 Penn graduate students
  - Instituted graduate student-led series of workshops for selecting schools, as well as writing statements of purpose and CVs
  - Built free, distributable resources for students to manage school lists, application deadlines, Physics GRE exams, and graduate application information
  - Hosted remote 2020 Penn GRAD Summer Academy; featured 30 students across 5 universities and 1 high school; offered to students conducting research with UPenn faculty; incorporated workshops on presentation skills, CVs, and scientific writing, as well as an end-of-summer research symposium in front of the whole department
  - Supervised subset (from GRAD Summer Academy) of 8 undergraduates to aid with individual research successes and challenges, lead group research discussions, and promote social engagement during remote summer program
- **Astronomy Ambassador** *January 2019 - Present*

- Program seeking early-career astronomers of diverse gender, racial, and cultural backgrounds; from institutions large and small and urban and rural; from throughout North America; and to encourage outreach activities with diverse audiences
- Inducted as member during 3-day workshop to train ambassadors on how to effectively engage the public during a variety of astronomy outreach events to numerous and diverse populations at the 233rd Meeting of the American Astronomical Society in Seattle, WA (January, 2019)
- “On-the-spot feedback” training (March 2021): workshop designed to teach tactics to respond to audience during virtual and in-person public engagement events. Training is an online community of scientists and public engagement experts interested in using audience feedback to improve the quality of outreach events. Workshop highlights strategies for working with diverse populations

#### • **Physics Tutor**

*September 2014 - Present*

- Worked individually with University of Pennsylvania post-Baccalaureate student 1-2 hours per week in introductory physics courses (September 2021 - May 2022)
- Worked individually with post-Baccalaureate student 1-3 hours per week in electricity and magnetism course (February 2021 - May 2021)
- Worked individually with University of Pennsylvania post-Baccalaureate student 1-2 hours per week in classical mechanics course (October 2019 - May 2020)
- Worked individually with University of Pennsylvania undergraduate 1-2 hours per week in classical mechanics course (October 2018 - December 2018)
- Worked individually with University of Pennsylvania undergraduate 1-2 hours per week in electricity and magnetism course (September 2018 - December 2018)
- Worked individually with University of Pennsylvania undergraduate 1-2 hours per week in introductory physics course (October 2018 - December 2018)
- Worked individually with two college students, each for 2-3 hours per week for help in Drexel University introductory physics course (September 2017 - June 2018)
- Worked individually with a foreign exchange high-school student for 3-4 hours per week for help in introductory physics (September 2014 - August 2015)

#### • **Physics Fellow, Drexel University**

*September 2016 - August 2017*

- Assisted in transition of freshmen physics majors from high school into college
- Held weekly office hours for freshmen physics majors to help with homework or studying
- Led study sessions specifically for exams pertaining to the Drexel freshman physics sequence
- Represented the Drexel Physics department and the College of Arts and Sciences at open houses for incoming/accepted students

#### • **Drexel University Society of Physics Students**

*September 2013 - June 2018*

- Served as the club’s Vice President from September 2015 - August 2016 and the club’s President from September 2016 - August 2017
- Contributed to winning multiple Society of Physics Students Outstanding Chapter Awards, as well as two Marsh White awards and one Future Faces of Physics award
- Acquired funding for nine members to attend the 2016 Quadrennial Physics Congress and present research
- Volunteered annually at Philadelphia Science Festival and Drexel University Kaczmarszik Days
- Tutored middle- and high-school students monthly at TeenSHARP program at Rutgers (Camden, NJ)

#### • **Drexel University Circle K**

*September 2013 - June 2018*

- Served as Editor from September 2013 - March 2015 and President from April 2015 - March 2016
- Led club to receiving dozens of individual and group awards while being recognized as Pennsylvania’s Most Outstanding Circle K chapter
- Volunteered over 500 hours of service to the greater Philadelphia community
- Built houses with Habitat for Humanity for a week-long experience in 2013
- Created monthly newsletters highlighting members and events

## TEACHING AND MENTORING EXPERIENCE

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- **Research Project with High-School Students** June 2022 - Present
  - Polygence*
    - Sara Albani, “Exoplanet Follow-ups with CARMENES and TESS” (in prep., 2023)
    - Shreyas Ramaswamy, “The Journey to Proxima Centauri b”, submitted to Journal of Emerging Investigators (2022)
- **Peer Mentorship** September 2020 - Present
  - UPenn Physics & Astronomy Graduate Department*
    - Amrut Nadgir, 1st-year graduate student (2023-Present)
    - Ernest Park, 1st-year graduate student (2022-2023)
    - Benjamin Harris, 1st-year graduate student (2022-2023)
    - Aditya Somasundaram, 1st-year graduate student (2021-2022)
    - Jackson Sipple, 1st-year graduate student (2020-2021)
- **Mentor to Undergraduates** September 2018 - Present
  - Through Penn GRAD*
    - Anika Patel, UPenn '23 graduate (anticipated)
    - Natascha Barac, UPenn '23 graduate (anticipated)
    - Saarah Hall, UPenn '22 graduate, currently a graduate student at Northwestern University
    - Yiwei Chai, UPenn '22 graduate, currently a graduate student at Johns Hopkins University
    - Joost Wanderborgh, UPenn '21 graduate, currently a Data Engineer
    - James Minnock, Drexel '20 graduate, currently a graduate physics student at Penn State University
    - Adriana Dropulic, UPenn '19 graduate, currently a graduate physics student at CalTech
    - Nate Wilson, UPenn '19 graduate, currently a data scientist
- **Teaching Assistant** August 2018 - December 2022
  - Led weekly, hour-long problem-solving lectures for PHYS 102 (August 2022 - December 2022), 50 students
  - Led weekly, hour-long problem-solving lectures for PHYS 102 (August 2021 - December 2021), 50 students
  - Taught, supervised, and graded 10 hours/week across 3 lab sections of PHYS 101 (August 2018 - December 2018), 30 students in total
  - Taught, supervised, and graded 10 hours/week across 3 lab sections of PHYS 102 (January 2019 - May 2019), 33 students in total

## PROFESSIONAL ASSOCIATIONS

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- American Astronomical Society September 2013 - Present
- American Physical Society September 2013 - 2018
- Society of Physics Students September 2013 - 2018

## ACADEMIC AND RESEARCH REFERENCES

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Cullen Blake, PhD  
University of Pennsylvania  
chblake@sas.upenn.edu

Jason Eastman, PhD  
Harvard-Smithsonian Center for Astrophysics  
jason.eastman@cfa.harvard.edu

Paul Robertson, PhD  
The University of California, Irvine  
paul.robertson@uci.edu