PRADIP GATKINE

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RESEARCH INTERESTS

I enjoy studying astrophysics, especially the high redshift universe, gamma ray bursts, cosmology and intergalactic medium. I also design and build instruments to observe the high redshift universe.

EDUCATION

University of Maryland College Park
PhD in Astronomy — Expected in 2020
PhD Thesis: Probing the early universe with GRBs
M.S. in Astronomy [GPA: 4.0/4.0] — Aug 2014 - Aug 2016
Masters Thesis: Development of on-chip astrophotonic spectrograph in near-infrared H-band

Indian Institute of Technology Bombay — 2010-2014
B.Tech. in Mechanical Engineering (with Honors) and Minor in Physics [GPA: 8.8/10.0]

AWARDS & HONORS

- **NASA Earth and Space Science Fellowship** in Astrophysics Division, awarded by National Aeronautics and Space Administration with three years of graduate research support (2018)
- **SPIE Optics and Photonics Education Scholarship** ($3500), for the prospect of long term contribution to the field of optics and photonics, International Society for Optics and Photonics (2017)
- **Kulkarni Graduate Student Summer Research Fellowship** ($5000), Univ. of Maryland (2016)
- **John Chi-Lin Wang Award for Academic Excellence** ($1000), for best overall performance in second-year project, courses and qualifying exam, Dept of Astronomy, University of Maryland (2016)
- **Best Student Presentation award** at SPIE Astronomical Telescopes + Instrumentation, (2016)
- **Best Poster Award**, Nanotechnology Day, University of Maryland (2016)
- **Dean's Fellowship** ($10,000) and **Merit Fellowship** ($2000), awarded to outstanding incoming graduate students, University of Maryland (2014-15)
- Received the prestigious Kishore Vaigyanik Protsahan Yojna **(Young Scientist Incentive Fellowship)** awarded by Dept. of Science and Technology, Govt. of India (2010)

RESEARCH EXPERIENCE

Probing the circumgalactic medium with Gamma-ray burst afterglows — Jan 2017 - Present

· We are using an extensive sample of 169 GRB afterglow spectra to probe the circumgalactic material around the GRB host galaxy by measuring the absorption features of metals
· Developed a Python-based pipeline for analyzing high- and low-resolution GRB afterglow absorption spectra and fitting multi-component Voigt profile to the metal-lines of interest ($\sim$ 40 absorption lines).
· The pipeline estimates the best-fit column density, Doppler width, and central velocity for each component in the absorption lines using Markov Chain Monte Carlo (MCMC) algorithm

Development of an Astrophotonic Spectrometer — Aug 2014 - July 2017

· Designed, fabricated, and characterized an on-chip photonic Arrayed Waveguide Grating (AWG) spectrometer device for future large telescopes to study high redshift GRB afterglows
· The AWG spectrometer device covers H-band in near-infrared (1450-1650 nm) with a moderate resolving power of 1500 and on-chip throughput of 65% with a chip size of 12mm x 6mm
· Devised a new and crucial technique to build polarization-insensitive photonic AWG spectrometer

Atmospheric OH-suppression to aid the study of Intergalactic Medium (IGM) 2015 - 2016

- Atmospheric OH emission lines are the biggest source of noise for faint near-IR sources. This emission can be effectively suppressed using a new technique called *Fiber Bragg-Grating* filters, which helps in improving the measurement of absorption lines due to IGM in the high-z GRB afterglow spectra
- Simulated the performance of the FBG filters for the upcoming *Maryland OH-suppression IFU system (MOHSIS)* instrument on the 4.3 m Discovery Channel Telescope (DCT) with detailed instrument pipeline and estimated a *ten-fold improvement in the signal-to-noise ratio* for GRB afterglows at z $\sim$ 9.

PUBLICATIONS / CONFERENCE PROCEEDINGS

1. **P. Gatkine**, A. Cucchiara, S. Veilleux, S. B. Cenko, *CGM-GRB: A survey of the CircumGalactic Medium around GRB hosts at $z > 1$* (to be submitted in June 2018)
2. **P. Gatkine** et al., *Arrayed waveguide grating spectrometers for astronomical applications: New results*, Opt. Express. 25:17918 17935, 2017 (peer reviewed)
3. **P. Gatkine** et al. *Development of high-resolution arrayed waveguide grating spectrometers for astronomical applications: first results*, Proceedings of SPIE Volume 9912, article id 991271, 2016
4. T. Zhu, Y. Hu, **P Gatkine**, et al. *Arbitrary On-chip Optical Filter Using Complex Waveguide Bragg Gratings*, Applied Physics Letters 2016 108:10 (peer reviewed).
5. T. Zhu, Y. Hu, **P. Gatkine**, et al. *Ultrabroadband High Coupling Efficiency Fiber-to-Waveguide Coupler Using Si_3N_4/SiO_2 Waveguides on Silicon*, IEEE Photonics Journal, vol. 8, no. 5, 2016 (peer reviewed).
6. **P. Gatkine**, K. P. Ray, *New Method for Asteroid Shape Detection using Spherical Segmentation based Delay Doppler Analysis*, International Radar Symposium, India 2013

OBSERVING EXPERIENCE & SKILLS

- **Observing Experience**: 4.3m Discovery Channel Telescope (6 nights, various transients), Ooty Radio Telescope, India (2 nights, pulsar observations)
- **Successful observing proposals**: 1. Co-I on HST Cycle 25 (6 orbits), 2. Co-I on Discovery Channel Telescope 2017C (5 hours ToO), 2017D (5 hours ToO), 2018A (10 hours ToO), 2018A (3 nights)
- **Programming:** Python, C++, C, LaTeX, Matlab, Labview, Mathematica, HTML.
- **Software tools**: Orange machine learning tool, Rsoft CAD and optical simulation, Fimmwave and Fimmprop photonic design and simulation, Zemax, Eagle circuit design, LT Spice circuit simulator

MENTORING & LEADERSHIP EXPERIENCE

- Currently mentoring a UMD undergraduate student on *building a Near-infrared camera for on-chip photonic spectrographs* (2018)
- Mentored three undergraduate students on *GW170817 evolution: Kilonova lightcurve and SED fitting* as a part of GRAD-MAP winter school, University of Maryland (2018)
- Mentored two UMD undergraduates as a part of *SPIE Educational Outreach (as a PI, awarded $3000 grant)* on building demonstrations of optical technologies in astronomy (2017-18)
- Mentored a pre-college student on *Search for lensed transients in iPTF survey* (Summer research 2017)
- Mentored a 4-member team for *NASA Space Settlement Design Contest* and was awarded Specialty Honorable Mention in Life Sciences (2011)

SERVICE/OUTREACH

- Served as Python bootcamp mentor at *GRAD-MAP Winter workshop*, Univ of MD (2018)
- Delivered two science popularization talks at *College Park Academy* for high school students (2016)
- Volunteered at *4th USA Science and Engg Festival* as a Science Laser Spectacular exhibitor (2016)