

# Yarone Meir Tokayer

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## EDUCATION

<b>Yale University</b> Ph.D., Physics, Advisors: Priyamvada Natarajan, Michael Koss Thesis: Title TBD M.S. and M.Phil (en route)	New Haven, CT exp. 2026 May 2023
<b>Columbia University</b> M.A., Philosophical Foundations of Physics, Advisor: David Z. Albert Thesis: "Probability in Everettian Quantum Mechanics"	New York, NY Feb. 2020
<b>The Cooper Union</b> B.S., Engineering, Minor in Mathematics, GPA: 3.9, <i>summa cum laude</i> Senior Project: "Muscle Denervation and Neurotensin as a Therapeutic Target for ALS"	New York, NY May 2014

## SKILLS AND LANGUAGES

- **Programming languages:** Python, MATLAB, C++, HTML
- **Software & Tools:** NASA HEASoft, Mathematica, Latex, LabVIEW, Excel
- **Python Libraries:**  
Astronomy: Astropy, Stingray, PyXSPEC  
Data and Visualization: Pandas, NumPy, Matplotlib
- **Telescope data:** Chandra, Swift, NuSTAR, NICER
- **Observing experience:**  
Palomar: Double Spectrograph, TripleSpec  
Keck: NIRC2+AO, OSIRIS+AO
- **Design Tools:** Arduino, Microchip PIC, AutoCAD, SolidWorks, laser cutting
- **Spoken languages:** English (native), Hebrew (fluent), Yiddish (intermediate)

## RESEARCH EXPERIENCE

<b>Constraining Dark Matter Profiles with GGSL Measurements</b> Graduate Research Assistant, PI: Priyamvada Natarajan <i>Using galaxy-galaxy strong lensing measurements to constrain cluster subhalo dark matter density profiles.</i> <ul style="list-style-type: none"><li>– Developed <u>fitting algorithms in Python</u> to find best fit DM profiles to cluster subhalos.</li><li>– Derived <u>empirical <math>c</math>-<math>M</math> relation</u>, which furthers tension between <math>\Lambda</math>CDM cosmological simulations and lensing observations on galaxy-scales, and is consistent with overefficient lensing observations.</li><li>– One paper submitted to ApJ; One paper in preparation.</li></ul>	Jan. 2022—Present Yale University
<b>Quantifying Selection Effects in Deep-Field AGN Surveys Using BASS</b> Graduate Research Assistant, PIs: Michael Koss, C. Megan Urry <i>Extra-galactic high energy astrophysics. Simulated low-redshift BASS AGN X-ray spectra at higher redshifts to detect bias in Chandra deep field AGN surveys</i> <ul style="list-style-type: none"><li>– Developed <u>simulation data pipeline</u> to generate Chandra AGN spectra at high redshifts redshifts using Python and XSPEC.</li><li>– <u>Spectral analysis</u> of 2800 simulated spectra to quantify bias in Chandra-COSMOS Legacy Survey.</li></ul>	Jul. 2021—Present Yale University

– Paper in preparation; poster presented at the Jan. 2023 meeting of the American Astronomical Society

### **NuSTAR Group, Columbia Astrophysics Laboratory**

Mar. 2020—Dec. 2020

Research Assistant, PIs: Charles Hailey, Kaya Mori

Columbia University

*Investigations in galactic high energy astrophysics.*

- Timing analysis of NICER observations of AR Scorpii, the only known “white dwarf pulsar” system. Measured spin period to sub- $\mu$ s precision; found pulsed non-thermal emission in X-ray band.
- Imaging analysis of NuSTAR observations of the “Eel Nebula” (PWN G18.5-0.4). Revealed synchrotron burnoff effect in the PWN and found evidence of a shock feature. Work published in *ApJ*.
- Spectral and timing analysis of NuSTAR observations of the TeV binary HESS J0632+057. Work published in *ApJ*.

### **GAPS Group, Columbia Astrophysics Laboratory**

Aug. 2019—Feb. 2020

Research Assistant, PI: Charles Hailey

Columbia University

*Fabrication, testing, passivation, and assembly of Si(Li) detector array modules to be used in GAPS flight (2022), which aims to detect antimatter evidence of dark matter annihilation in the galactic halo.*

### **Motor Neuron Center, Columbia University Medical Center**

Sep. 2013—May 2014

Research Assistant, PI: Christopher Henderson; Supervisor: Dima Yudin

Columbia University

*Senior capstone project: ALS pathology in mouse and cell culture models.*

- Immunohistochemistry of neuro-muscular junction sites to measure denervation in ALS mouse models over time across the body.
- Optimization of embryonic stem cell-derived motor neuron cultures to determine the effect of various trophic factors.

### **Lung Perfusion Bioreactor**

Jan. 2011—May 2011

Undergraduate Researcher, Faculty: Eric Lima (Cooper Union),  
Gordana Vunjak-Novakovic (CUMC)

Cooper Union/Columbia University

*Designed and built prototype used for testing on swine lung.*

## **PUBLICATIONS AND POSTERS**

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### *Refereed Journal Publications*

1. Burgess, D., Mori, K., Gelfand, J. D., et al. (incl. **Tokayer, Y. M.**), The Eel Pulsar Wind Nebula: a PeVatron-Candidate Origin for HAWC J1826–128 and HESS J1826–130. *The Astrophysical Journal*, 930, 148, May 2022.  
doi:10.3847/1538-4357/ac650a
2. **Tokayer, Y. M.**, An, H., Halpern, J. P., et al., Contemporaneous Multi-Wavelength Campaign to Study HESS J0632+057s Distinctive Light Curve. *The Astrophysical Journal*, 923, 17, Dec. 2021.  
doi:10.3847/1538-4357/ac2c6a

### *Conference Posters*

3. **Tokayer, Y. M.**, Koss, M., Urry, C. M., et al., Quantifying Selection Effects in Deep-Field AGN Surveys with BASS. In: *241<sup>st</sup> Meeting of the AAS*, January 8–12, 2023. Seattle, WA.  
Link to poster.
4. Woo, J., An, H., Burgess, D., et al. (incl. **Tokayer, Y. M.**), Multi-wavelength Study of PeVatron Candidate Pulsar Wind Nebulae. In: *AAS/High Energy Astrophysics Division 19<sup>th</sup> Annual Meeting*, March 13–17, 2022. Pittsburgh, PA.

5. Saffold, N., **Tokayer, Y. M.**, Mori, K., A NICER X-ray View of White Dwarf Pulsar AR Scorpii. In: *237<sup>th</sup> Meeting of the AAS*, January 10–15, 2021. Virtual.  
Link to poster.

#### *Papers in Preparation*

6. **Tokayer, Y. M.**, Koss, M., Urry, C. M., et al., Quantifying AGN Selection Effects in the Chandra COSMOS-Legacy Survey with BASS. In prep for *The Astrophysical Journal*
7. **Tokayer, Y. M.**, Dutra, I., Natarajan, P., et al., Dependence of GGSL cross section on the internal distribution of matter in  $\Lambda$ CDM substructure. Submitted to *The Astrophysical Journal*
8. **Tokayer, Y. M.**, Natarajan, P., Meneghetti, M., et al., The concentration-mass relation of cluster substructures in  $\Lambda$ CDM. In prep for *The Astrophysical Journal*

## ACADEMIC PRESENTATIONS

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#### *Invited Talks*

9. “The Unified AGN Model in X-ray observations,” Columbia University High-Energy Astrophysics Meeting; Jan. 28, 2022. Virtual.

#### *Conference Talks*

10. “Quantifying AGN Selection Effects in the Chandra COSMOS-Legacy Survey with BASS,” Accretion History of AGN (AHA) III Workshop; December 15, 2023; Miami, FL.
11. “Quantifying Selection Effects in Deep-Field AGN Surveys,” New England Regional Quasar and AGN Meeting (NERQUAM); May 6, 2022; Storrs, CT.
12. Saffold, N., **Tokayer, Y. M.**, “A NICER X-ray View of White Dwarf Pulsar AR Scorpii,” Spring 2021 NICER Data Analysis and Science Workshop; May 13, 2021. Virtual.  
Video of presentation.

## ACCEPTED PROPOSALS

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13. Co-Investigator. Ref #GN-2024A-Q-138 for Gemini GMOS Observations. *Resolving Mrk 248: A Potential Triple AGN with a Hidden 500 pc Dual AGN*.  
PI: Michael Koss
14. Co-Investigator. Proposal 8087 for NuSTAR Observations. *A Survey of the Most Luminous Hard X-ray Selected Obscured Quasars at  $z=0.2-0.4$* .  
PI: Michael Koss
15. Co-Investigator. Proposals 90296 and 094349 for XMM-Newton Observations. *A Survey of the Most Luminous Hard X-ray Selected Obscured Quasars at  $z=0.2-0.4$* .  
PI: Michael Koss

## CONFERENCES, WORKSHOPS, AND SUMMER SCHOOLS ATTENDED

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- **Accretion History of AGN (AHA) III Workshop**  
University of Miami. December 14–17, 2023. Miami, FL.
- **Cosmology Summer School**  
University of Michigan. June 5–9, 2023. Ann Arbor, MI.
- **241<sup>st</sup> Meeting of the AAS**  
January 8–12, 2023. Seattle, WA.

- **New England Regional Quasar and AGN Meeting (NERQUAM)**  
University of Connecticut. May 6, 2022. Storrs, CT.
- **NICER Data Analysis and Science Workshop**  
May 13, 2021. Virtual.

## TEACHING

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### Yale University

Graduate Teaching Fellow

- Graduate Statistical Physics I (PHYS 512)* Spring 2024
- University Physics for the Life Sciences (PHYS 171)* Spring 2023
- Introduction to Mathematical Methods of Physics (PHYS 301)* Fall 2022
- General Physics Laboratory II (PHYS S166)* Summer 2022
- General Physics Laboratory II (PHYS 166L)* Spring 2022
- General Physics Laboratory I (PHYS 165L)* Fall 2021

### SAR High School

Chemistry Teacher Spring 2021

- Taught four 10<sup>th</sup> grade chemistry sections spanning three levels from remedial to honors*

Physics Teacher and Advisor Fall 2014—Spring 2019

- Designed curriculum and taught 4 physics courses on two tracks for 11<sup>th</sup> and 12<sup>th</sup> grade*
- Taught 11 grade Jewish Philosophy course, 9 and 11 grade Jewish text study*
- 10<sup>th</sup> grade advisor*
- Designed and oversaw engineering-related elective and co-curricular programming*
- Coached robotics team that won second place in robotics competition at the Technion in Haifa, Israel*

### Naaleh High School for Girls

STEM Teacher Fall 2019—Spring 2020

- Wrote curriculum and taught a course in computer programming and engineering design*
- Designed and instructed Python coding co-curricular; club was a member of Girls Who Code*

### The Cooper Union

Teaching Assistant Fall 2021

- Introductory Physics Lab (PH291)*

## COMMUNITY ENGAGEMENT AND OUTREACH

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### Service

**Slifka Center for Jewish Life at Yale**, Board of Trustees 2023—Present

**Physics Department Faculty Hiring Committee**, Graduate Student Representative Spring 2023

### Outreach

**Astronomy on Tap** Fall 2022—Present

- Astronomy nights at a New Haven bar, featuring trivia and talks by members of the Yale Astronomy Department.*

**Super Science Showdown**, Yale Open Labs Spring 2022

- Interactive science events for students in grades 6-8 in New Haven County.*

**Engineers as Teachers**, Iridescent and Cooper Union Spring 2011

- Wrote and built interactive lesson plans on the topic of sound and music
- Lessons were taught at family science nights in local NYC middle school

### *Public Talks*

1. "The hype is real: what we are already learning from the most powerful telescope in human history," SAR High School; Jan. 4, 2023; Riverdale, NY.

## AWARDS AND SCHOLARSHIPS

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- **Teacher Award**  
2017 Robotraffic Competition at the Technion in Haifa, Israel, as coach to the SAR High School team
- **Entrance Scholarship**  
Philosophical Foundations of Physics Program, Columbia University, Fall 2016
- **Tau Beta Pi**  
Engineering Honors Society
- **Goodman Prize**  
Cooper Union, Spring 2013
- **Dean's List**  
Cooper Union, all semesters