

SARAH RUGHEIMER

CONTACT INFORMATION Department of Physics and Astronomy +1 (437) 265-4848
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CITIZENSHIP Switzerland, US

LANGUAGES English (native), German (B1)

RESEARCH INTERESTS I study the climate and atmospheres of habitable exoplanets. My research particularly focuses on the star-planet interaction, studying the effect of UV activity on the atmospheric chemistry and the detectability of biosignatures in a planet's atmosphere with future missions such as JWST/ELT and mission concepts such as Large Interferometer for Exoplanets (LIFE) and NASA's planned Habitable Worlds Observatory.

APPOINTMENTS

Associate Professor, York University **July 2022 - present**
Research stream faculty in Physics and Astronomy
Allan I. Carswell Chair for the Public Understanding of Astronomy

Glasstone Research Fellow, Oxford University **Oct 2018 - June 2022**
Glasstone Postdoctoral Research Fellowship
Hugh Price Fellowship at Jesus College, Oxford

Simons Research Fellow, St. Andrews University **Oct 2015 - Sept 2018**
Simons Foundation Origins of Life Postdoctoral Research Fellow

Research Associate, Cornell University, Carl Sagan Inst. **Feb 2015 - Aug 2015**

EDUCATION

Harvard University, Cambridge, MA **September 2008 - January 2015***

M.A. in Astronomy *June 2010*

Ph.D. in Astronomy & Astrophysics *June 2010 - January 2015*

- Thesis Title: Hues of Habitability: Characterizing Pale Blue Dots Around Other Stars
- Advisors: Lisa Kaltenegger and Dimitar Sasselov
- Chosen as one of 8 PhD students at Harvard throughout Graduate School Arts and Sciences as a [2014 Harvard Horizons Scholar](#)

* Harvard recognized a 1.5 years delay in time caring for terminally ill father.

University of Calgary, Calgary, Alberta Canada

B.Sc. (First Class Honors), Physics **Sept 2003 - June 2007**

- Graduated top of class in Department of Physics and Astronomy
- Senior Thesis Topic: Uses of Attractive Bose-Einstein in Atom Interferometers
- Undergrad summer research projects: placing quantum dots in phospholipid vesicles as a precursor to tracking active neuron cells with Dr. X.L. Wu (2003); modeling MEG data on brain surfaces generated from MRI data with Dr. Mingui Sun (2005); and numerically modeled Earth-like planets in the habitable zone of the nearby star system of HD 69830 with Dr. Haghighipour (2006).

Flathead Valley Community College **Sept 2002 - May 2003**

LIST OF 3RD
PARTY FUNDS

- ◇ C\$125k as PI - NSERC Discovery Grant
- ◇ C\$12.5k as PI - NSERC Starting Launch Fellowship
- ◇ C\$20k as PI - Carswell Public Outreach Funds
- ◇ C\$50k as co-I Academic Innovation Fund
- ◇ £165k as PI - Glasstone Oxford Postdoctoral Research Fellowship
- ◇ £10k as PI - Hugh Price Fellowship at Jesus College, Oxford
- ◇ \$250k as PI - Simons Postdoctoral Origins of Life Fellowship

AWARDS

- NSERC Discovery Grant 2022-2027 (Canadian national funding for research group)
- Heising-Simons Scialog SLU Fellow 2023
- Academic Innovation Fund (AIF) grant co-I to increase access for students with disabilities
- [TED 2020 Fellow and talk - 1.7 million views](#)
- Glasstone Oxford Postdoctoral Research Fellowship
- Hugh Price Fellowship at Jesus College, Oxford
- Simons Postdoctoral Origins of Life Fellowship
- BSA Rosalind Franklin Prize in the Physical Sciences and Math 2019
- Barrie Jones Astrobiology Outreach and Education Award 2019
- Caroline Herschel Prize Lectureship 2018
- [2014 Harvard Horizons Scholar](#)
- D.A.A.D Fellowship
- Derek Bok Center Distinction in Teaching Award for *The Energetic Universe*, Spring 2012, Harvard University
- Venkatesan Silver Medallion, for being the top graduate in my physics class at the University of Calgary in 2007

COMMUNITY
INVOLVEMENT &
SERVICE

[LIFE - Large Interferometer for Exoplanets](#) mission design Core Team Member and co-lead of Project Office (2018 - present)

EGU Planetary Science Team Officer (2021 - 2023)

Reviewer for NASA's XRP & FINESST, Canada's NSERC, and Germany's DFG grant schemes.

Reviewer for the journals: *Nature*, *Nature Scientific Reports*, *MNRAS*, *A&A*, *ApJ*, *AJ*, *ApJL*, *FACETS*, *MDPI*, *Astrobiology*, and *Elements*

Editor for Oxford Research Encyclopedia of Planetary Science at Oxford University Press (2018 - 2021)

Co-organizer for Lorentz Exocomet Workshop, May 2019

Co-organizer for Lorentz LIFE Workshop, rescheduled for 2022 due to COVID

LOC for Exoclines Oxford, Aug 2019

OBSERVING
PROPOSALS

Co-I on HST Cycle 22 - The MUSCLES Treasury Survey: Measurements of the Ultraviolet Spectral Characteristics of Low-mass Exoplanetary Systems (PI - Kevin France, ID 13650)

Co-I on HST Cycle 25 The Mega-MUSCLES Treasury Survey: Measurements of the Ultraviolet Spectral Characteristics of Low-mass Exoplanetary Systems (PI - Cynthia Froning, ID 15071)

Co-I on HST Cycle 25 The M Dwarf UV Spectra Irradiating Nearby Transiting Terrestrial Planets (PI - Zach Berta-Thompson, ID 15264)

*Claringbold, A., Rimmer, P., **Rugheimer, S.**, and Shorttle, O. (2023) Prebiosignature Molecules Can Be Detected in Habitable Exoplanet Atmospheres with JWST. *AJ*, 166, 39. [10.3847/1538-3881/acdacc](https://doi.org/10.3847/1538-3881/acdacc)

*Student Co-advised

Cooke, G.J., Marsh, D.R., Walsh, C., **S Rugheimer, S.**, and Villanueva, G.L. (2022) Variability due to climate and chemistry in observations of oxygenated Earth-analogue exoplanets. *MNRAS*, stac2604. [doi:10.1093/mnras/stac2604](https://doi.org/10.1093/mnras/stac2604)

Konrad, B.S., Alei, E., Quanz, S. P., Mollière, P., Angerhausen, D., Fortney, J., Hakim, K., Jordan, S., Kitzmann, D., **Rugheimer, S.**, Shorttle, O., Wordsworth, R., and the LIFE Collaboration (2023) Large Interferometer For Exoplanets (LIFE) IX. Assessing the impact of clouds on atmospheric retrievals at mid-infrared wavelengths with a Venus-twin exoplanet. *A&A* 673, A94, 29. [doi:10.1051/0004-6361/202245655](https://doi.org/10.1051/0004-6361/202245655)

Alei, E., Konrad, B.S., Angerhausen, D. Grenfell, J.L., Mollière, P., Quanz, S.P., **Rugheimer, S.**, Fabian Wunderlich, and the LIFE Collaboration (2022) Large Interferometer For Exoplanets (LIFE) V. Diagnostic potential of a mid-infrared space interferometer for studying Earth analogs. *A&A*, 665, A106. [doi:10.1051/0004-6361/202243760](https://doi.org/10.1051/0004-6361/202243760)

Konrad BS, Alei E, Quanz SP, Angerhausen D, Carrión-González Ó, Fortney JJ, Grenfell JL, Kitzmann D, Mollière P, Rugheimer S, Wunderlich F. (2022) Large Interferometer For Exoplanets (LIFE)-III. Spectral resolution, wavelength range, and sensitivity requirements based on atmospheric retrieval analyses of an exo-Earth. *A & A*. 664:A23. [doi:10.1051/0004-6361/202141964](https://doi.org/10.1051/0004-6361/202141964)

LIFE Collaboration, Quanz, S. et al. including **S. Rugheimer** (2021) Large Interferometer For Exoplanets (LIFE): I. Improved exoplanet detection yield estimates for a large mid-infrared space-interferometer mission. *A&A* 664, A21 (2022), [doi:10.1051/0004-6361/202140366](https://doi.org/10.1051/0004-6361/202140366)

Gialluca, M., Robinson, T, **Rugheimer, S.**, Wunderlich, F. (2021) Characterizing Atmospheres of Transiting Earth-like Exoplanets Orbiting M Dwarfs with James Webb Space Telescope, *PASP* 133 054401 [doi:10.1088/1538-3873/abf367](https://doi.org/10.1088/1538-3873/abf367)

*Gregory, B., Claire, M., and **Rugheimer, S.** (2021) Photochemical modelling of atmospheric oxygen levels suggests two stable states. *EPSL*, 561, 116818. [doi:10.1016/j.epsl.2021.116818](https://doi.org/10.1016/j.epsl.2021.116818)

*Student Advised

Rimmer, P., Ranjan, S., and **Rugheimer, S.** (2021) Life's Origin and the Search for Life on Rocky Exoplanets. *Elements*, 17, 4.

LIFE Collaboration, Quanz, S. et al. including **S. Rugheimer** (2021) Atmospheric characterization of terrestrial exoplanets in the midinfrared: biosignatures, habitability, and diversity. *Experimental Astronomy* [doi:10.1007/s10686-021-09791-z](https://doi.org/10.1007/s10686-021-09791-z)

Duvvuri, G.M., Pineda, J.S., Berta-Thompson, Z.K., Brown, A., France, K., Kowalski, A.F., Redfield, S., Tilipman, D., Vieytes, M.C., Wilson, D.J., Youngblood, A., Froning, C., Linsky, J., Loyd, R.O.P., Mauas, P., Miguel, Y., Newton, E.R., **Rugheimer, S.**, and Schneider, P.C. (2021) Reconstructing the Extreme Ultraviolet Emission of Cool Dwarfs Using Differential Emission Measure Polynomials. *ApJ*. 913:40. [doi:10.3847/1538-4357/abeaaf](https://doi.org/10.3847/1538-4357/abeaaf)

Wilson, D.J., Froning, C.S., Duvvuri, G.M., France, K., Youngblood, A., Schneider, C.P., Berta-Thompson, Z., Brown, A., Buccino, A.P., Hawley, S., Irwin, J., Kaltnegger, L., Kowalski, A., Linsky, J., Loyd, R.O.P., Miguel, Y., Pineda, J.S., Redfield, S., Roberg, A., **Rugheimer, S.**, Tian, F., and Vieytes, M. (2021) The Mega-MUSCLES Spectral Energy Distribution of TRAPPIST-1, *ApJ* 911:18. [doi:10.3847/1538-4357/abe771](https://doi.org/10.3847/1538-4357/abe771)

Frohman EM, Villemarette-Pittman NR, Rodriguez A, Glanzman R, Rugheimer S, Komogortsev O, Zamvil SS, Cruz RA, Varkey TC, Frohman AN, Frohman AR. (2021) Application of an evidence-based, out-patient treatment strategy for COVID-19: Multidisciplinary medical practice principles to prevent severe disease. *Journal of the neurological sciences.* 426:117463.

Kaltenegger, L., Lin, Z., **Rugheimer, S.** (2020) Finding signs of life on transiting earth-like planets: high-resolution transmission spectra of earth through time around FGKM host stars. *ApJ*, 904:10. [doi:10.3847/1538-4357/abb9b2](https://doi.org/10.3847/1538-4357/abb9b2)

Stüeken, E., Som, S.M., Claire, M., **Rugheimer, S.**, Sherf, M., Sproß, L., Tosi, N., Ueno, Y., and Lammer, H. (2020) Mission to planet earth: the first two billion years, *Space Sci Rev*, 216:31, [doi:10.1007/s11214-020-00652-3](https://doi.org/10.1007/s11214-020-00652-3)

Melbourne, K., Youngblood, A., France, K., Froning, C.S., Pineda, J.S., Shkolnik, E.L., Wilson, D.J., Wood, B.E., Basu, S., Roberge, A., Schlieder, J.E., Cauley, P.W., Loyd, R.O.P., Newton, E.R., Schneider, A., Arulanantham, N., Berta-Thompson, Z., Brown, A., Buccino, A.P., Kempton, E., Linsky, J., Logsdon, S.E., Mauas, P., Pagano, I., Peacock, S., Redfield, S., **Rugheimer, S.**, Schneider, P.C., Teal, D.J., Tian, F., Tilipman, D., and Vieytes, M. (2020) Estimating the Ultraviolet Emission of M dwarfs with Exoplanets from Ca II and H-alpha. *AJ*, 160: 6. [doi:10.3847/1538-3881/abfb5c](https://doi.org/10.3847/1538-3881/abfb5c)

Linsky, J.L., Wood, B.E., Youngblood, A., Brown, A., Froning, C.S., France, K., Buccino, A.P., Cranmer, S.R., Mauas, P., Miguel, Y., Pineda, S., **Rugheimer, S.**, Vieytes, M., Wheatley, P.J., Wilson, D.J. (2020) The relative emission from chromospheres and coronae: dependence on spectral type and age. *ApJ*, 902:1. [doi:10.3847/1538-4357/abb36f](https://doi.org/10.3847/1538-4357/abb36f)

Dandouras, I., Blanc, M., Fossati, L., Gerasimov, M., Guenther, E.W., Kislyakova, K.G., Lammer, H., Lin, Y., Marty, B., Mazelle, C., **Rugheimer, S.**, Scherf, M., Sotin, C., Sproß, L., Tachibana, S., Wurz, P., Yamauchi, M. (2020) Future Missions related to the determination of the elemental and isotopic composition of Earth, Moon and the terrestrial planets. *Space Science Reviews*, 216, 121. [doi:10.1007/s11214-020-00736-0t](https://doi.org/10.1007/s11214-020-00736-0t)

France, K., Duvvuri, G., Egan, H., Koskinen, T., Wilson, D.J., Youngblood, A., Froning, C.S., Brown, A., Alvarado-Gomez, J.D., Berta-Thompson, Z.K., Drake, J.J., Garraffo, C., Kaltnegger, L., Kowalski, A.F., Linsky, J.F., Loyd, R.O.P., Mauas, P.J.D., Miguel, Y., Pineda, J.S., **Rugheimer, S.** Schneider, P.C., Tian, F., and Vieytes, M. (2020) The High-Energy Radiation Environment Around a 10 Gyr M Dwarf: Habitable at Last? *AJ*. 160, 5. [doi:10.3847/1538-3881/abb465](https://doi.org/10.3847/1538-3881/abb465)

Kaltenegger, L., Madden, J., Lin, Z., **Rugheimer, S.**, Segura, A., Luque, R., Palle, E., and Espinoza, N. (2019) The Habitability of GJ 357 d: Possible Climates and Observability. *ApJL* 883:L40. [doi:10.3847/2041-8213/ab3d40](https://doi.org/10.3847/2041-8213/ab3d40)

Rimmer, P. & **Rugheimer, S.** (2019) Hydrogen Cyanide in Nitrogen-Rich Atmospheres of Rocky Exoplanets. *Icarus*, 329: 124-131. [doi:10.1016/j.icarus.2019.02.020](https://doi.org/10.1016/j.icarus.2019.02.020)

Rimmer, P., Shorttle, O., & **Rugheimer, S.** (2019) Oxidised Micrometeorites are Evidence for Low Atmospheric Pressure on the Early Earth. *Geochemical perspective letters*, 9: 38-42. doi:10.7185/geochemlet.1903

*Kawashima, Y. & **Rugheimer, S.** (2019) Theoretical Reflectance Spectra of Earth-Twins Through Their Evolutions: Impact of Clouds and Detectability of O₂, H₂O, and CH₄ with LUVOIR Telescope. *AJ*, 157:5. doi:10.3847/1538-3881/ab14e3

*Student Advised

Froning, C., Kowalski, A., France, K., Loyd, R.O.P., Schneider, C., Youngblood, A., Wilson, D., Brown, A., Berta-Thompson, Z., Pineada, J.S., Linsky, J., **Rugheimer, S.** and Miguel, Y. (2019) A Hot Ultraviolet Flare on the M Dwarf Star GJ 674, *ApJL*, 871(2):L26. doi:10.3847/2041-8213/aaffcd

Rugheimer, S. and Kaltenegger, L. (2018) Spectra of Earth-like Planets Orbiting FGKM Stars Through Geological Evolution, *ApJ*, 854:19. doi:10.3847/1538-4357/aaa47a

Airapetian, V.S. et al. and 46 co-authors including **Rugheimer, S.** (2019) Impact of Space Weather on Climate and Habitability of Terrestrial Type Exoplanets, *International Journal of Astrobiology* 1-59. doi:10.1017/S1473550419000132

Schwieterman, E.W., Kiang, N.Y., Parenteau, M.N., Harman, C.E., DasSarma, S., Fisher, T.M., Arney, G.N., Hartnett, H.E., Reinhard, C.T., Olson, S.L., Meadows, V.S., Cockell, C.S., Walker, S.I., Grenfell, J.L., Hegde, S., **Rugheimer, S.**, Hu, R., Lyons, T.W. (2018) Exoplanet Biosignatures: A Review of Remotely Detectable Signs of Life, *Astrobiology* 18(6), 663-708. doi:10.1089/ast.2017.1729

Blumenthal, S.D., Mandell, A.M., Hebrard, E., Batalha, N.E., Cubillos, P.E., **Rugheimer, S.**, Wakeford, H.R. (2018) A Comparison of JWST Spectra from Equilibrium & Disequilibrium Chemistry Models in Gaseous Planets. *ApJ* 853, 138. doi:10.3847/1538-4357/aa9e51

Loyd, R.O.P., France, K., Youngblood, A., Schneider, C., Brown, A., Hu, R., Segura, A., Linsky, J., Redfield, S., Tian, F., **Rugheimer, S.**, Miguel, Y., Froning, C. (2018) The MUSCLES Treasury Survey V: FUV Flares on Active and Inactive M Dwarfs. *ApJ* 867:71. doi:10.3847/1538-4357/aae2bd

Youngblood, A., France, K., Loyd, R.O.P., Brown, A., Mason, J.P., Schneider, P.C., Tilley, M.A., Berta-Thompson, Z.K., Buccino, A., Froning, C.S., Hawley, S.L., Linsky, J., Mauas, P.J.D., Redfield, S., Kowalski, A., Miguel, Y., Newton, E.R., **Rugheimer, S.**, Segura, A., Roberge, A., and Vieytes, M. (2017) The MUSCLES Treasury Survey IV: Scaling Relations for Ultraviolet, Ca II K, and Energetic Particle Fluxes from M Dwarfs. *ApJ*. 843: 31. doi:10.3847/1538-4357/aa76dd

Domagal-Goldman Shawn D., Wright Katherine E., & 47 co-authors including **Rugheimer, S.**, (2016) Astrobiology Primer 2.0, *Astrobiology* 16: 8, 561-653. doi:10.1089/ast.2015.1460

France, K., Loyd, R.O.P., Youngblood, A., Brown, A., Schneider, P.C., Hawley, S.L., Froning, C.S., Linsky, J.L., Roberge, A., Buccino, A.P., Davenport, J., Fontenla, J.M., Kaltenegger, L., Kowalski, A.K., Mauas, P., Miguel, Y., Redfield, S., **Rugheimer, S.**, Tian, F., Vieytes, M.C., Walkowicz, L.M., and Weisenburger, K.L. (2016) The MUSCLES Treasury Survey I: Motivation and Overview, *ApJ*, 820: 2, 89. doi:10.3847/0004-637X/820/2/89

Youngblood, A., France, K., Loyd, R.O.P., Linsky, J.L., Redfield, S., Schneider, P.C., Wood, B.E., Brown, A., Froning, C., Miguel, Y., **Rugheimer, S.**, and Walkowicz, L. (2016) The MUSCLES Treasury Survey II: Intrinsic Lyman Alpha and Extreme Ultraviolet Spectra of K and M Dwarfs with Exoplanets, *ApJ*. 824: 2, 101. [doi:10.3847/0004-637X/824/2/101](https://doi.org/10.3847/0004-637X/824/2/101)

Loyd, R.O.P., France, K., Youngblood, A., Schneider, C., Brown, A., Hu, R., Linsky, J., Froning, C.S., Redfield, S., **Rugheimer, S.**, and Tian, F. (2016) The MUSCLES Treasury Survey III: X-Ray to Infrared Spectra of 11 M and K Stars Hosting Planets, *ApJ*. 824: 2, 102. [doi:10.3847/0004-637X/824/2/102](https://doi.org/10.3847/0004-637X/824/2/102)

Rugheimer, S., Kaltenecker, L., Segura, A., Linsky, J. and Mohanty, S. (2015) Influence of UV activity on the Spectral Fingerprints of Earth-like Planets around M dwarfs. *ApJ*. 809:57. [doi:10.1088/0004-637X/809/1/57](https://doi.org/10.1088/0004-637X/809/1/57)

Rugheimer, S., Segura, A., Kaltenecker, L., Sasselov, D. (2015) Surface UV fluxes for Earth-like planets around FGKM stars. *ApJ*. 806:137. [doi:10.1088/0004-637X/806/1/137](https://doi.org/10.1088/0004-637X/806/1/137)

Miguel, Y., Kaltenecker, L., Linsky, J. and **Rugheimer, S.** (2015) The Effect of Lyman alpha Radiation on Mini-Neptune Atmospheres Around M Stars: Application to GJ 436b. *MNRAS*. 446: 345-353. [doi:10.1093/mnras/stu2107](https://doi.org/10.1093/mnras/stu2107)

Kaltenecker, L., Sasselov, D. and **Rugheimer, S.** (2013) Water Planets in the Habitable Zone: Atmospheric Chemistry, Observable Features, and the case of Kepler-62e and -62f. *ApJL*. 775: L47. [doi:10.1088/2041-8205/775/2/L47](https://doi.org/10.1088/2041-8205/775/2/L47)

Rugheimer, S., Kaltenecker, L., Zsom, A., Segura, A., Sasselov, D., (2013) Spectral Fingerprints of Earth-like Planets around FGK Stars. *Astrobiology*. March 2013, 13(3): 251-269. [doi:10.1089/ast.2012.0888](https://doi.org/10.1089/ast.2012.0888)

Kaltenecker, L., Miguel, Y. and **Rugheimer, S.**, (2012) Rocky exoplanet characterization and atmospheres. *International Journal of Astrobiology* 11(04): 297-307.

SELECTED WHITE PAPERS

Quanz et al., S and 47 co-authors including **Rugheimer, S.** (2019) Atmospheric characterization of terrestrial exoplanets in the mid-infrared: biosignatures, habitability & diversity *White paper for the Voyage 2050 long-term plan in the ESA Science Programme* [arXiv:1908.0131](https://arxiv.org/abs/1908.0131)

Fortney, J. et al. and 86 co-authors including **Rugheimer, S.** (2019) The Need for Laboratory Measurements and Ab Initio Studies to Aid Understanding of Exoplanetary Atmospheres. *Astro2020 Science White Paper*, [arXiv:1905.07064](https://arxiv.org/abs/1905.07064)

Parry, I. and 22 co-authors including **Rugheimer, S.** (2018) SUPERSHARP - Segmented Unfolding Primary for Exoplanet Research via Spectroscopic High Angular Resolution Photography. [arXiv:1801.06111](https://arxiv.org/abs/1801.06111)

Domagal-Goldman, S. and 40 co-authors including **Rugheimer, S.** (2018) Life Beyond the Solar System: Remotely Detectable Biosignatures. This is a white paper that was submitted to the National Academies of Sciences Study: Astrobiology Science Strategy for the Search for Life in the Universe. [arXiv:1801.06714](https://arxiv.org/abs/1801.06714)

Airapetian, V. S. , Danchi, W. C.1, Dong, C. F.3, **Rugheimer, S.** and 32 co-authors (2018) Life Beyond the Solar System: Space Weather and Its Impact on Habitable Worlds. Submitted to the National Academy of Sciences in support of the Astrobiology Science Strategy for the Search for Life in the Universe. [arXiv:1801.07333](https://arxiv.org/abs/1801.07333)

LIST OF COURSES
TAUGHT AND
TEACHING
EXPERIENCE

Course Head:

York University, Toronto, ON, Canada

- **PHYS 1470 - Highlights of Astronomy** **Spring & Fall 2023**
First year astronomy course for engineering students (calculus pre-requisite)
- **PHYS 3070 - Planets and Planetary Systems** **Fall 2023**
Third year astrophysics majors course

University of St. Andrews, St. Andrews, Scotland, UK

- **Astrobiology: The Search for Life in the Universe** **Spring 2017**
I designed and led a new first year interdisciplinary module with over 100 students.
- **Environmental Geochemistry, ES 5010** **Spring 2016**
Taught module “Mineral evolution through geological history” for this senior level geology course

Tufts University, Medford, MA USA

- **Life on Earth and Beyond** **Fall 2013**
 - Visiting Lecturer to create and teach a new laboratory and lecture astrophysics course
 - Course filled to maximum capacity within 1 hour of registration opening.
 - Nominated by graduating seniors in 2016 for this course as having been one of the “most impactful to your intellectual and personal development while at Tufts”
 - Complete course evals: http://www.sarahrugheimer.com/EXP022_Eval.pdf

Teaching Assistant:

Harvard University, Cambridge, MA USA

Teaching Fellow for following courses:

- **The Energetic Universe** **Spring 2012**
 - An introductory Astronomy course for non-majors taught by Robert Kirshner.
 - Received Distinction in Teaching Award
- **Stellar and Planetary Astrophysics** **Fall 2010**
 - A graduate level Astronomy course taught by Dimitar Sasselov.
- **Life as a Planetary Phenomenon** **Spring 2010**
 - An introductory Astrobiology course for non-majors taught by Dimitar Sasselov.

Teaching and Pedagogy Training:

- ◇ Completed Harvard’s Bok Center Teaching Certificate
- ◇ Harvard University’s “Scientists Teaching Science” hands-on course on active learning and effective science education with Professor Philip Sadler
- ◇ Harvard University’s Bok Center Course “Problems with the Blackboard: Tools for Teaching Science & Math” with John Girash
- ◇ Harvard University’s Finding Your Voice workshop on giving effective presentations with Nancy Houfek.
- ◇ Completed AAS Centre for Astronomy Education Course on Active Learning

ADVISING
EXPERIENCE

York University in collaboration with **Cambridge, UK**

- **Advising MSc student Joshua Parsons** **May 2023 - current**
Thesis: “Habitability of Brown Dwarfs”
- **Advising MSc student DingDing Wang** **Sept 2023 - current**
Thesis: “General circulation models of eccentric planets”
- **Advising bachelors student Mark Vertlib** **Nov 2022 - current**
Topic: “False Positives in atmospheres without a cold trap”
- **Advising bachelors student Leith Arnold** **Nov 2022 - current**
Topic: “1D convective cloud modeling”
- **Advising bachelors student Joshua Parsons** **Nov 2022 - May 2023**
Thesis: “Habitability of Brown Dwarfs”

University of Oxford in collaboration with **Cambridge, UK**

- **Co-advising MSc student Alastair Claringbold** **Sept 2021 - June 2022**
Thesis: “Prebiosignatures: Detecting the Origin of Life.”

University of St. Andrews, St Andrews, UK

- **Co-advising PhD student Bethan Gregory** **Sept 2016 - June 2021**
Thesis: “Development of a 1-D oxygen isotope photochemical model and its application to atmospheric O₂”, viva passed Dec 2020, thesis accepted March 2021.

University of Oxford, Oxford, UK

- **Pastoral advisor for physics PhD student RJ Graham** **Oct 2018 - present**
Thesis: “The Silicate Weathering Feedback and its Influence on Rocky Planet Climat”
- **Pastoral advisor for physics PhD student Jinzhao Sun** **Oct 2018 - present**
Thesis: “Coupling of magnetic order and charge transport in the europium topological semimetal candidates”

Kavli Exoplanet Atmospheres Summer Program, Santa Cruz, CA

- **Advised graduate student Yui Kawashima** **Summer 2016**
Project: “Impact of clouds on detecting oxygen with LUVUOIR” paper published
- **Advised postdoc Dr. Liu Hui-Gen** **Summer 2016**
Project: “TRAPPIST-1 and Assessing the Habitability of Ultra-cool Dwarfs”

Cornell University, Ithaca, NY

- **Mentored PhD student Thea Kozakis** **Jan 2015 - July 2016**
Project title: “Habitability of White Dwarfs”

SELECTED PRESS TV interview at [Breakfast TV Toronto about DART](#)
Review I wrote for *Science*: [The Hunt for Planet B](#)
Feature article I wrote for New Scientist: [Is There Anybody Out There?](#)

Articles or interviews about my research:

[Announcement as a TED 2020 Fellow](#)

[Interview on my podcast and TED fellowship from University of Calgary](#)

[British Science Festival Lecture Summary: Are we alone in the Universe?](#)

[Are We Alone? British Science Association Rosalind Franklin Prize Interview](#)

[Phys.org - Earth holds the key to detecting life beyond our solar system](#)

[Planetary.org - Creating a guidebook for Earth's hypothetical twin](#)

[BBC Radio 4 Inside Science - Understanding Biosignatures](#)

[Cornell - Astronomers create array of Earth planet models](#)

[Daily Mail UK - Computer models reveal how Earth-like Planets Evolve in Time](#)

[Harvard Gazette - Doctoral student focuses on atmosphere in search for extrasolar life](#)

[Flathead Beacon - Looking for life beyond our own](#)

PRESENTATIONS **Selected Invited Oral**

- Harvard Colloquium, 14 Feb 2023
- Peter Sim Memorial Lecture, RASC Calgary, 23 Oct 2022
- Keynote on Planetary Habitability, PFE-SPP 1992, Berlin, 12 Sept 2022
- Plenary talk at Brazilian Astrobiology Annual Meeting, 30 Nov 2021
- McMaster University colloquium, 17 June 2021
- Stanford Colloquium, 30 March 2021
- University of Amsterdam Colloquium, 18 March 2021
- University of Warwick, *The Origins of Life On Earth and the Search for Life on Exoplanets* 17 Feb 2021
- University of Belfast colloquium, 28 Oct 2020
- University of Hertfordshire colloquium, 7 Oct 2020
- *Detecting Pre-biosignatures: Failed biosphere or planet ready for life?* Antibiosignatures U Chicago conference 27 May 2020
- University of Florida colloquium, 13 Feb 2020
- Barrie Jones Award Lecture, 6 Dec 2019
- BSA Rosalind Franklin Prize Lectureship, 10 Sept 2019
- ETH Zurich Earth Sciences colloquium, 1 Oct 2019
- Northwestern colloquium, 12 April 2019
- University of Cambridge colloquium, 5 Feb 2019
- University of Heidelberg colloquium, 5 Dec 2018
- Royal Astronomical Society and Royal Geological Society, London, 20 Nov 2018
- Caroline Herschel Lecture, Herschel Society, Bath, 21 Nov 2018
- *Biosignatures, Atmospheres, & Implications for Life* ISSI, Bern, Oct 2018
- *FVCC Commencement Address*, Kalispell, Montana, May 2018
- *UV, Biosignatures, and Life* Columbia University, colloquium, 18 April 2018
- *UV, Biosignatures, and Life* NYU - Abu Dhabi, colloquium, 8 Oct 2017
- *UV, Biosignatures, and Life* Climate Science, Atmospheres and Life: From the Earth and Beyond, University of Cambridge, 17 May 2017
- *How to Detect Life on Another Planet*, Next in Science, Radcliffe Institute for Advanced Study, Harvard, 14 Oct 2016
- *Terrestrial exoplanets under M dwarf Irradiation*, Opportunity M, Harvard, 2016
- *A Review of Biosignatures*, NExSS, 27 June 2016
- *Characterizing Pale Blue Dots Around FGKM Stars*, AGU, Dec 2015

Selected Contributed Oral

- *Biosignatures Through Rocky Planet Evolution Around Other Stars*, LATSIS ETH Zurich, 1 Sept 2022
- *Detecting Pre-Biosignatures in the atmospheres of Earth-like planets around M and G stars*, British Planetary Society Conference, 13 Jan 2020

- *Detecting Biosignatures and Pre-Biosignatures in the Atmospheres of Earth-like Planets Around Other Stars with High Resolution Spectroscopy*, HoRSE - High Resolution Spectroscopy for Exoplanet Atmospheres, Nice France, Oct 2018
- *Prebiotic Signatures and Geological Progression of Biosignatures* ESO Diversis Mundi: The Solar System in an Exoplanetary context (OPSIII), Chile, Mar 2018
- *Remote Detectability of Oxygen through Geological Time around FGKM Stars*, AbSciCon, Phoenix, 24 April 2017
- *Using the PandExo JWST Simulator*, UK EXOM, St. Andrews, UK, March 2017
- *Importance of UV in Characterizing Pale Blue Dots Around FGKM Stars*, Extreme Solar Systems III - Kona, Hawaii, Dec 2015
- *UV Surface Environments of Earth-like Planets Orbiting FGKM Stars Through Geological Evolution*, AbSciCon - Chicago, IL, June 2015
- *Characterizing Pale Blue Dots Around Other Stars*, AAS Dissertation Talk - Seattle, WA, January 2015
- *Influence of UV activity on the Spectral Fingerprints of Earth-like Planets around M dwarfs*, EBI - Search for Life Beyond the Solar System - Tuscon, AZ, Mar 2014
- *Influence of UV activity on the Spectral Fingerprints of Earth-like Planets around M dwarfs*, MPIA - Heidelberg, Germany, Mar 2014
- *Comparison of Transit Spectra of the First Small Exoplanets in the HZ Kepler 62 e & f*, Division for Planetary Sciences - DPS - Denver, Oct 2013
- *Cosmic Habitability*, AbGradCon, Sweden, June 2010

MENTORING & SERVICE

At UC Santa Cruz and the University of St. Andrews, I developed two workshops for PhD students on the impostor syndrome and public speaking which have run in my department and are now being run University wide through Student Services. At Columbia University, I was invited to develop a mental health workshop for the equity and diversity program and have now given that at several institutions. I also volunteered for a geoscience outreach to local Scottish secondary schools called GeoBus and am on the Equality and Diversity Committee at St. Andrews. I also helped launch WISSA - Women in Science at St. Andrews and served as our School's representative.

I was the pastoral supervisor for two D.Phil students at Oxford in the Physics department. At St. Andrews, I mentored a PhD student in geology. I was a mentor through Harvard Graduate Woman in Science and Engineering (HGWISE) for a female undergraduate student at Harvard. I served as a departmental representative on the HGWISE board in 2011 to 2013. I also was a mentor for an internal graduate mentoring program. From 2009-2013, I served as one of two graduate representatives on the Committee for Academic Studies which monitored the progress of all Harvard astronomy graduate students and advocated for student concerns.

PUBLIC OUTREACH

At York University, I have an active public outreach role as the Allan I. Carswell Chair for the Public Understanding of Astronomy. I've done radio, TV, printed press, and public talks in my role to engage the Canadian public in Astronomy.

In 2020, I wrote and recorded a 10 lecture series for the Teaching Company and Amazon Originals called "[Searching for Extraterrestrial life](#)".

I was a TED 2020 Fellow and gave a remote mainstage TED talk due to COVID with over 1.7 million views called "[The Search for Microscopic Aliens.](#)" The TED Fellows Program is a highly competitive program for junior academics, artists, and entrepreneurs that the TED selection committee believes have shown unusual accomplishment in their respective disciplines and for their future impact potential.

I co-host a podcast with Dr. Sarah Ballard called "[Self-care with Drs. Sarah](#)" where we discuss techniques for productivity, mental health, and successfully managing the pressures of academia to bring your full engagement to science in a sustainable way.

On BBC Radio 4's *Inside Science* with Adam Rutherford I gave an [interview](#) on the prospect of detecting biosignatures in the next few decades and the steps required to be prepared for observations with JWST and large ground-based observatories. I was a guest again on BBC Radio 4's [The Curious Cases of Rutherford and Fry](#) with

Drs. Adam Rutherford and Hannah Fry.

Through GeoBus, I've led workshops on Mars exploration and scientific literacy, and created a [youtube video on biosignatures](#) in a minute. This video was chosen as for the Goldschmidt 2017 Wild Orbit Film Festival.

I am interested in science and education policy and how scientists can better communicate our findings to the public. With two other graduate students I launched PolicyLab in 2013 as an outlet for Harvard science graduate students where I served as senior editor the communications director.

In 2019, I wrote a feature article for the Aug 31st issue of New Scientist "[Is Anybody Out There?](#)" I have written for Science in the News (STIN), a public outreach organization dedicated to presenting scientific concepts to the public. Scientific literacy and reforming the way we teach science are fundamental to our future economic, social, and world growth and sustainability. The articles I have written include "[Can Humans Play Red Rover?](#)"; "[A Tale of Two Worlds](#)"; and "[Are We Alone? - How astronomers hope to find life in the Universe.](#)"

I have spoken [on live radio at Boston's National Public Radio \(NPR\)](#) about finding Earth-like planets and biosignatures, and was on a [panel at MIT](#) to discuss the science behind the movie *Interstellar*. At the Edinburgh Science Festival, I was on a panel about the ethics of detecting and potentially interacting with alien life. At SETI, I gave a talk "Why is Earth Still Habitable?"

INTERESTS

I love high altitude and glacier mountaineering and have climbed e.g. Denali (20,000', 6096m), Cayambe (18,996' / 5790m), Chimborazo - Veintimilla (20,440' / 6230m), Mt. Rainier (14,410' / 4392 m), Mt. Baker (10,781' / 3286 m), Mt. Kilimanjaro (19,341' / 5895 m), and Aconcagua (22,841' / 6962 m). I also competed internationally in Irish Dance for 11 years.

ACADEMIC REFERENCES

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