

# SHMUEL BIALY

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## APPOINTMENTS

<b>Faculty</b> - Senior Lecturer (Assistant Prof. equivalent), tenure track Physics Department, Technion - Israel Institute of Technology, Haifa, Israel	03/2022 –
<b>CTC Postdoctoral Prize Fellow</b> University of Maryland, College Park, MD., USA	09/2021 – 03/2022
<b>ITC Postdoctoral Prize Fellow</b> Harvard-Smithsonian Center for Astrophysics, Cambridge, MA., USA	09/2018 – 08/2021

## EDUCATION

<b>Ph.D. in Astronomy: direct Ph.D. program</b> (MA + PhD) Tel-Aviv University. Advisor: Prof. Amiel Sternberg Thesis: <i>Atomic and Molecular Interstellar Gas Processes Across Cosmic Time</i>	10/2012 – 08/2018
<b>B.Sc. Physics: Magna cum Laude</b> Tel-Aviv University (TAU)	10/2009 – 10/2012

## PRIZES

<a href="#">Alon Scholarship</a> for the Integration of Outstanding Faculty	2023
Postdoctoral Scientist Prize for Excellence, Department of Astronomy, UMD	2022
<a href="#">Marie Skłodowska-Curie</a> Postdoctoral Fellowship (awarded, declined by candidate)	2021
<a href="#">KITP</a> Postdoctoral Prize Fellowship (awarded, declined by candidate)	2021
<a href="#">Oort</a> Postdoctoral Prize Fellowship (awarded, declined by candidate)	2021
<a href="#">Dan David</a> Prize Fellowship	2017

## TELESCOPE TIME GRANTED

<b>PI:</b> “Probing the cosmic ray ionization rate with $H_2$ rovibrational line emission - the Taurus survey”, <b>James Webb Space Telescope</b> 48 observing hours with JWST were awarded (program <a href="#">8961</a> – cycle 4)	2025
<b>PI:</b> “Constraining Cosmic Rays with $H_2$ Ro-Vibrational Excitation in Dense Clouds”, <b>James Webb Space Telescope</b> 12.7 observing hours with JWST were awarded (program <a href="#">5064</a> - cycle 3)	2024
<b>PI:</b> “Using Molecular Clouds as Cosmic-Ray Detectors”, MMT Observatory 24 observing hours with MMT were awarded	2020
<b>Co-I:</b> NASA <a href="#">SOFIA</a> legacy program, “ <i>HyGAL: characterizing the Galactic interstellar medium with hydrides</i> ” ( <a href="#">link</a> ). (PIs: D. Neufeld and P. Schilke)	2019-2022

## GRANTS

<b>PI:</b> <a href="#">ISF</a> Grant + equipment grant: <i>The interplay of turbulence, gas cooling and chemistry in the dynamic interstellar medium</i>	2024-2028
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<b>PI:</b> GIF Grant: <i>Cold clouds as cosmic ray detectors</i>	2025-2026
<b>Co-I:</b> NASA ADAP Grant, “ <i>Shaken or stirred: How stellar feedback drives interstellar turbulence?</i> ” (PI: S. Stanimirovic)	2021-2023
<b>Co-I:</b> French National Research Agency Grant, <i>The H I-to-H<sub>2</sub> transition in the high redshift Universe</i> . (PI: P. Noterdaeme).	2018-2022

## PROFESSIONAL SERVICE

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<b>Technion’s Astrophysics Seminar Organizer</b> , Technion	Since 2023
<b>Panel Reviewer</b> , James Webb Space Telescope	2023-2024
<b>CTC Seminar Series Organizer</b> , UMD	09/2021-03/2023
<b>ITC Seminar and Colloquium Committee</b> , Harvard-CfA	09/2018–09/2020
<b>Co-organizer and Science Committee Member</b> <i>Harvard-Heidelberg Star-Formation Conference</i>	11/2019
<b>Peer Reviewer</b> Journals: ApJ., MNRAS, A&A	

## TEACHING

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<b>Lecturer.</b> Technion Course: Intro to Astrophysics and cosmology.	Fall semester, 2023
<b>Teaching Assistant</b> , Tel-Aviv University Course: Electromagnetism (av. score 94 % + Rector’s 100 best TA list)	10/2012–08/2018
<b>Lecturer</b> , Tel-Aviv University Science Oriented Youth Course: Introduction to Astronomy and Cosmology	10/2014–10/2015

## PUBLIC OUTREACH

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<b>Public Media</b> – Working with Harvard’s press office and reporters, producing public articles and movies on the discovery of the <a href="#">Per-Tau</a> Shell ( $\sim 200\text{M}$ readers worldwide)	10/2021
<b>TAU Astro-Club</b> – Organizing monthly public lectures, guided night-sky observations and open-house events in the Wise observatory. ( <a href="#">link</a> )	10/2012–08/2018
<b>A Star is Born</b> – a podcast at the Israeli national radio <i>Kan</i> , where I discuss central topics in Astronomy and Cosmology (3 episodes, 40 min. each) ( <a href="#">link</a> )	2017
<b>Tel Aviv-Jaffa Social Involvement Program</b> Teaching math & physics to schoolchildren of disadvantaged populations at Jaffa.	10/2011–10/2015

## TALKS (SELECTED TALKS OVER THE LAST 5 YEARS)

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### Seminars and Colloquia

Ben Gurion University, Israel	06/24
ENS Paris, Paris Observatory	02/24
CAS Seminar, Max Planck Institute for Extraterrestrial Physics, Munich	09/23
Astrophysics Seminar, University of Washington	05/23
Astrophysics Seminar, UNAM, Morelia, Mexico	03/23
Colloquium, University of Maryland, College Park	02/23
Local Universe Group Seminar, STScI	12/22
Astronomy Colloquium, NASA JPL	12/22

Astronomy Tea-Talk, Caltech	12/22
ISM Salon, Flatiron Institute, Center for Computational Astrophysics (CCA), NYC	05/22
CAS Seminar, Max Planck Extraterrestrial Physics, Garching, Germany	06/21
Galaxy Crawl, University of Arizona	04/21
Rutgers University Astrophysics Seminar	01/21
Koenigstuhl Colloquium, Max Planck Institute for Astronomy, Heidelberg	11/20
TAPIR seminar, Caltech	11/20
Astrophysics Seminar, The Technion, Israel Institute of Technology, Haifa	11/20
Astrophysics Seminar, The Weizmann Institute for Science, Rehovot	11/20
Astrophysics Seminar, Hebrew University, Jerusalem	11/20
Astrophysics Seminar, Tel-Aviv University, Tel-Aviv	11/20
Galaxy Evolution Seminar, Center for Computational Astrophysics, NYC	07/20
Galaxy Crawl, University of Arizona	06/20

### Conference Talks

“Cosmic rays - the salt of the star formation recipe 3”, Florence	10/24
“SuperNova EXplosions Conference (SNEX)”, Technion, Israel	08/23
“6th Meeting of the the Interstellar Institute”, Paris	06/23
“The Olympian Symposium 2023”, Paralia, Greece	05/23
“Cosmic rays - the salt of the star formation recipe II”, Florence, Italy	11/22
“A Holistic View of Stellar Feedback and Galaxy Evolution”, Ascona, Switzerland	06/22
“Origins Workshop - ISM, Star and Cluster Formation”, Salt Lake City + virtual	01/22
“The Grand Cascade: ISM 2021”, Institut Pascal, Orsay, France	07/21
“Fundamentals of Gaseous Halos” KITP workshop	01/21
236 <sup>th</sup> American Astronomical Society Conference	06/20

## PUBLICATION LIST (ONLY REFEREED JOURNALS)

- **43** Total papers in refereed journals (out of which: 40 published, 3 accepted)
  - **16** First Author papers
  - **1738** citations, h-index=22 (G-Scholar; November 2025)
1. **Bialy, S.**, Chemke, A., Neufeld, D. A., Muzerolle Page, J., Ivlev, A. V., Belli, S., Gaches, B. A. L., Godard, B., Bisbas, T. G., Caselli, P., Jacob, A. M., Padovani, M., Rab, C., Silsbee, K., Porter, T. A., *The first detection of cosmic-ray excited  $H_2$  in interstellar space*, accepted for publication in *Nature Astronomy* (2025) – [link](#)
  2. Neufeld, D. A., Silsbee, K., Ivlev, A. V., **Bialy, S.**, Gaches, B. A. L., Padovani, M., Belli, S., Bisbas, T. G., Chemke, A., Godard, B., Muzerolle Page, J., Rab, C., *JWST observations of cosmic-ray-excited  $H_2$  in Barnard 68: spatial variations and constraints on cosmic-ray attenuation*, accepted for publication in *ApJ* (2025) – [link](#)
  3. Johnson, M., Burkhart, B., D'Eugenio, F., Tacchella, S., Maiolino, R., **Bialy, S.**, Le Bourlot, J., Roueff, E., Le Petit, F., Bron, E., Abgrall, H., Nelson, E., Menon, S., Orr, M. E., *Detecting Molecular Hydrogen ( $H_2$ ) Emission at Cosmic Dawn*, *ApJ.*, 992, 196 (2025) – [link](#)
  4. Gurman, A., Sternberg, A., **Bialy, S.**, Cochrane, R. K., Stern, J., *Molecular Hydrogen in High-redshift Damped Lyman- $\alpha$  Absorbers*, accepted for publication in *ApJ* (2025) – [link](#)
  5. Gao, B. A., Zucker, C., Sridharan, T. K., Swiggum, C., **Bialy, S.**, O'Neill, T. J., Peek, J. E. G., Bianchi, L., Benjamin, R., McCallum, L., Goodman, A., Alves, J., Lada, C., Edenhofer, G., Smith, R., Watkins, E., Wood, K., Anderson, D., *Origin of the IRAS Vela Shell: New Insights from 3D Dust Mapping*, *ApJ.*, 987, 73 (2025) – [link](#)
  6. **Bialy, S.**, Burkhart, B., Seifried, D., Sternberg, A., Godard, B., Krumholz, M., et al., *The Molecular Cloud Lifecycle I: Constraining  $H_2$  formation and dissociation rates with observations*,

ApJ., 982, 24 (2025) – [link](#)

7. Burkhardt, B., Dharmawardena, T., E., **Bialy, S.**, Haworth, T., Cruz Aguirre, F., Jo, Y.-S., Andersson, B-G, Chung, H., et al., *A Nearby Dark Molecular Cloud in the Local Bubble Revealed via H<sub>2</sub> Fluorescence*, *Nature Astronomy*, 9, 1064 (2025) – [link](#)
8. Godard, B., des Forets, G. P., **Bialy, S.**, *Shocks in the warm neutral medium. I. Theoretical model*, *A&A*, 688, A169 (2024) – [link](#)
9. Burkhardt, B., **Bialy, S.**, Seifried, D., Walch, S., Hamden, E., Haworth, T., Hoadley, K., Kong, S., et al., *The Molecular Cloud Life Cycle. II. Formation and Destruction of Molecular Clouds Diagnosed via H<sub>2</sub> Fluorescent Emission*, *ApJ.*, 975, 269 (2024) – [link](#)
10. Park, G., Lee, M.-Y., **Bialy, S.**, Burkhardt, B., Dawson, J. R., Heiles, C., Li, D., Murray, C., Nguyen H., Hafner, A., Rybarczyk, D. R. Stanimirovic, S. “*Probing the Conditions for the HI-to-H<sub>2</sub> Transition in the Interstellar Medium*”, *ApJ.*, 955, 145 (2023) – [link](#)
11. Foley, M., Goodman, A., Zucker, C.; Forbes, J., Konietzka, R., Swiggum, C., Alves, J., Bally, J., Soler, J., Grosschedl, J., **Bialy, S.**, Grudic, M., Leike, R., Ensslin, T., “*A 3D View of Orion: I. Barnard’s Loop*”, *ApJ.*, 947, 2 (2023) – [link](#)
12. Sternberg, A., **Bialy, S.**, Gurman A., “*HI in Molecular Clouds: Irradiation by FUV plus Cosmic Rays*”, *ApJ.*, 960, 8S (2023) [link](#)
13. Kim, W.-J., Schilke, P., Neufeld, D. A., Jacob, A. M., Sanchez-Monge, A., Seifried, D., Godard, B., Menten, K. M., Walch, S., Falgarone, E., Veena, V. S., **Bialy, S.**, Moller, T., Wyrowski, F., “*HyGAL: Characterizing the Galactic ISM with observations of hydrides and other small molecules. II. The absorption line survey with the IRAM 30 m telescope*”, *A&A*, 670, A111 (2022) – [link](#)
14. **Bialy, S.**, Belli, S., Padovani, M., “*Constraining the cosmic-ray ionization rate and their spectrum with MMT observations of dense molecular clouds: a test-bed for JWST*”, *A&A Letters*, 658, L13 (2022) – [link](#)
15. Zucker, C., Goodman, A., Alves, J, **Bialy, S.**, et al. “*Star formation near the Sun is driven by expansion of the Local Bubble*”. *Nature*, 601, 7893 (2022) – [link](#)
16. Gaches, B., Bisbas, T., **Bialy, S.**, “*The impact of cosmic-ray attenuation on the carbon cycle emission in molecular clouds*”. *A&A*, 658, A151 (2022) – [link](#)
17. Padovani, M., **Bialy, S.**, Galli, D., Ivlev A., Grassi T., Scarlett L., Rehill U., Zammit, M., Fursa D., Igor I., “*Cosmic rays in molecular clouds probed by H<sub>2</sub> rovibrational lines - Perspectives for the James Webb Space Telescope*”, *A&A*, 658, A189 (2022) – [link](#)
18. Jacob, A., Neufeld, D., Schilke, P., Wiesemeyer, H., Kim, W., **Bialy, S.**, et al., “*HyGAL: Characterizing the Galactic ISM with observations of hydrides and other small molecules – I. Survey description and a first look toward W3(OH), W3 IRS5 and NGC 7538 IRS1*”, *ApJ.*, 930, 141 (2022) – [link](#)
19. Syed, J., Soler, J., Beuther, H., Wang, Y., Suri, S., Henshaw, J., Reiner, M., **Bialy, S.**, et al. “*The “Maggie” filament: Physical properties of a giant atomic cloud*”. *A&A*, 657, A1 (2022) – [link](#)
20. Gaches, B., **Bialy, S.**, Bisbas, T., Padovani, P., Seifried, D., Walch, S., “*Cosmic-ray-induced H<sub>2</sub> line emission. Astrochemical modeling and implications for JWST observations*”, *A&A*, 664, 150 (2022) – [link](#)
21. Hamden, E., Schiminovich, D., Nikzad, S., Turner, N., Burkhardt, B., Haworth, T., Hoadley, K., Kim, S., **Bialy, S.**, et al. “*A far-UV space telescope for high-resolution spectroscopy over wide fields*”, *JATIS*, 8, 044008 (2022) – [link](#)

22. **Bialy, S.**, Zucker, C., Goodman, A., Foley, M., Alves, J., Semenov, V., Benjamin, R., Leike, R., Enßlin, T. “*The Per-Tau Shell: A Giant Star-Forming Spherical Shell Revealed by 3D Dust Observations*”. *ApJ. Letters*, 919, L5 (2021) – [link](#)
23. Zucker, C., Goodman, A., **Bialy, S.**, Koch, E., Speagle, J., A., Foley, M., Finkbeiner, D., Leike, R., Enßlin, T. “*On the 3D Spatial Topologies of Local Molecular Clouds*”. *ApJ* 919, 35 (2021) – [link](#)
24. Sternberg, A., Gurman, A., **Bialy, S.**, “*HI-to-H<sub>2</sub> Transitions in Dust-Free Interstellar Gas*”. *ApJ.*, 920, 83 (2021) – [link](#)
25. **Bialy, S.**, “*The far-UV Interstellar Radiation Field in Galactic Disks: Numerical and Analytic Models*”. *ApJ.*, 903, 62 (2020) – [link](#)
26. **Bialy, S.**, “*Cold Clouds as Cosmic-Ray Detectors*”, *Nature Communication Physics*, 3, 32 (2020) – <https://www.nature.com/articles/s42005-020-0293-7>
27. **Bialy, S.**, Burkhart, B. “*The Turbulence Driving Scale – Density Decorrelation Scale Relation in a Turbulent Medium*”, *ApJ Letters*, 894, L2 (2020) – [arXiv:2001.06023](#)
28. Hu, Y., Lazarian, A., & **Bialy, S.**, “*Study Turbulence and Probe Magnetic Fields Using the Gradient Technique: Application to HI-to-H<sub>2</sub> Transition Regions*”. *ApJ.*, 905, 129 (2020) – [arXiv:2008.00387](#)
29. Burkhart, B., Appel, S., **Bialy, S.**, et al. “*The Catalogue for Astrophysical Turbulence Simulations (CATS)*”. *ApJ.*, 905, 14 (2020) – [arxiv.org/abs/2010.11227](#)
30. **Bialy, S.**, Neufeld, D., Wolfire, M., Sternberg, A., Burkhart, B. “*Chemical Abundances in a Turbulent Medium: H<sub>2</sub>, OH<sup>+</sup>, H<sub>2</sub>O<sup>+</sup>, ArH<sup>+</sup>*”, *ApJ.* 885, 109 (2019) – [arXiv:1909.12305](#)
31. **Bialy, S.**, Sternberg, A. “*Thermal Phases of the Neutral Atomic Interstellar Medium - from Solar Metallicity to Primordial Gas*”, *ApJ.*, 881, 160 (2019) – [arXiv:1902.06764](#)
32. Lingam, M., Ginsburg, I., **Bialy, S.** “*Active Galactic Nuclei: Boon or Bane for Biota?*”, *ApJ.* 877, 62 (2019) – [arXiv:1903.09768](#)
33. **Bialy, S.**, Loeb, A. “*Could Solar Radiation Pressure Explain 'Oumuamua's Peculiar Acceleration?*”, *ApJ. Letters*, 868, L1 (2018) – [arXiv:1810.11490](#)
34. Schrubba, A., **Bialy, S.**, Sternberg, A., “*The Metallicity Dependence of the H I Shielding Layers in Nearby Galaxies*”, *ApJ.*, 862, 110 (2018) – [arXiv:1805.05353](#)
35. Ranjan, A., Noterdaeme, P., Krogager, J.-K., Petitjean, P., Balashev, S. A., **Bialy, S.**, et al. “*Molecular gas and star formation in an absorption-selected galaxy: Hitting the bull's eye at  $z \simeq 2.46$* ”, *A&A*, 618, A184 (2018) – [arXiv:1806.07827](#)
36. **Bialy, S.**, Burkhart, B., Sternberg, A. “*The H I-to-H<sub>2</sub> Transition in a Turbulent Medium*”, *ApJ.*, 843, 92 (2017) – [arXiv:1703.08549](#)
37. **Bialy, S.**, Bihl, S., Beuther, H., Henning, H., & Sternberg, A., “*H I-to-H<sub>2</sub> Transition Layers in the Star-Forming Region W43*”, *ApJ*, 835, 126 (2017) – [arXiv:1612.02428](#)
38. Bisbas, T. .G., van Dishoeck, E. F., Papadopoulos, P. P., Szucs, L., **Bialy S.**, & Zhang, Z.-Y., “*Cosmic-Ray Induced Destruction of CO in Star-Forming Galaxies*”, *ApJ.*, 839, 90 (2017) – [arXiv:1703.08598](#)
39. **Bialy, S.**, & Sternberg, A., “*Analytic H I-to-H<sub>2</sub> Photodissociation Transition Profiles*”, *ApJ.*, 822, 83 (2016) – [arXiv:1601.02608](#)
40. Cohen, A., **Bialy, S.**, & Schwartz, M., “*The self consistent expansion applied to the factorial function*”, *Physica A: Statistical Mechanics and its Applications*, 463, 503 (2016) – <http://www.sciencedirect.com/science/article/pii/S0378437116304617>

41. **Bialy, S.**, Sternberg, A., Lee, M-Y., Le Petit, F., & Roueff, E., “*H I-to-H<sub>2</sub> Transitions in the Perseus Molecular Cloud*”, ApJ., 809, 122 (2015) – [arXiv:1505.06200](#)
42. **Bialy, S.**, Sternberg, A., & Loeb, A., “*Water Formation During the epoch of First Metal Enrichment*”, ApJ. Letters, 804, 29 (2015) – [arXiv:1503.03475](#)
43. **Bialy, S.**, & Sternberg, A., “*CO/H<sub>2</sub>, C/CO, OH/CO, and OH/O<sub>2</sub> in Dense Interstellar Gas: From High Ionization to Low Metallicity*”, MNRAS, 450, 4424 (2015) – [arXiv:1409.6724](#)