

CONTACT INFORMATION	Assoc. Research Scientist X-ray Laboratory NASA Goddard Space Flight Center Mail Code 662 Greenbelt, MD 20771 USA	Mobile: +1-301-286-1155 E-mail: antara.r.basu-zych@gmail.com WWW: astroantara.wordpress.com/
SUMMARY OF PROFESSIONAL AND RESEARCH INTERESTS	<p>Dr. Basu-Zych's interest and expertise involves multi-wavelength studies of starburst galaxies over the history of the Universe to understand the conditions within and surrounding these galaxies. Specifically, this research targets local analogs of Lyman break galaxies, a key population of high-redshift galaxies, to explore the evolution of galaxy properties in ultraviolet-selected (actively star-forming, dust- and metal-poor) galaxies as compared to other local star-forming galaxies (with lower SFRs) and infrared-selected galaxies (with similarly high SFRs, but with significantly higher dust content) over cosmic time. Within the topic of galaxy evolution, Dr. Basu-Zych's interests include investigating: star formation histories using multi-wavelength diagnostics and approaches; X-ray binary formation and evolution; close pair systems, where the galaxy environment is conducive to interacting and merging galaxies; dust and metallicity properties; HI gas content and the role of gas in star formation efficiency; galaxy kinematics and dynamics and relation to galaxy feedback; Lyman alpha blobs.</p> <p>Additionally, Dr. Basu-Zych serves as NASA's High Energy Astrophysics Science Archive Research Center (HEASARC) staff scientist, maintaining the archive, web-pages, help desk and monitoring and analyzing the usage statistics.</p>	
EDUCATION	<p>Columbia University, New York, NY</p> <p>Ph.D., Astronomy, Jan 2009</p> <ul style="list-style-type: none"> • Thesis Topic: <i>Nature of $z < 1$ Ultraviolet-Luminous Galaxies</i> • Advisor: Professor David Schiminovich <p>M.A., Astronomy, Feb 2005</p> <p>University of California, Berkeley, Berkeley, CA</p> <p>B.A., Physics and Astronomy, May 2000</p>	
RESEARCH EXPERIENCE	<p>Associate Research Scientist Jan 2016 to current</p> <p>CRESST II UMBC/NASA GSFC</p> <ul style="list-style-type: none"> • HEASARC Staff Scientist • maintaining database tables, developing user software for HEASARC, and managing public advocacy activities for the NASA Virtual Observatories. <p>Post-Doctoral Research Associate Nov 2012 to Jan 2016</p> <p>CRESST UMBC/NASA GSFC</p> <ul style="list-style-type: none"> • Support Scientist for Physics of the Cosmos • X-ray studies of nearby and distant star-forming galaxies <p>CRESST USRA/NASA Postdoctoral Researcher July 2012 to Nov 2012</p> <p>NASA Goddard Space Flight Center</p> <ul style="list-style-type: none"> • Study of X-ray binary populations in Lyman break galaxies/analogs <ul style="list-style-type: none"> – Supervisor: Dr. Ann Hornschemeier <p>NASA Postdoctoral Position (NPP) Fellow July 2009 to July 2012</p>	

NASA Goddard Space Flight Center

- X-ray and Swift UVOT Studies of Star-Forming Galaxies
– Supervisor: Dr. Ann Hornschemeier

Graduate Thesis 2005 – 2009

Department of Astronomy, Columbia University

- Multiple projects on UV-luminous galaxies
– Thesis Advisor: Prof. David Schiminovich

Graduate Research, Second year project 2003 – 2004

- Used 100ks of archived Chandra data to study X-ray emission in Ly α Blobs.
– Supervisor: Dr. Caleb Scharf

Columbia University, 1st year project 2002 – 2003

- X-ray project on pulsed emission from rotation-powered pulsars
– Supervisor: Dr. Eric Gotthelf

Lawrence Livermore National Laboratory, Undergraduate 1996 – 2000

- Worked with MACHO database and HST data to study microlensing candidates
– Supervisor: Drs. Kem Cook and Charles Alcock

RELEVANT

OBSERVING

EXPERIENCE &

RESEARCH TOOLS

Optical Astronomy: MDM 2.4m spectroscopy, HST (WFPC2)

Near Infrared: OSIRIS at Keck2 Integral Field Spectroscopy

Radio Observing: J/VLA interferometry, GBT

X-ray Analysis and Simulations: Chandra/ACIS (CIAO), MARX, SIXTE, SIMX

Computer skills: IDL, Python, GBTIDL, AIPS, SQL, IRAF, Perl, C

Stellar Synthesis Code: BC03, PEGASE

Survey Data: FIRST, GALEX, SDSS, COSMOS, MUSYC, ACS-GOODS, COMBO-17, Chandra Deep Field South

SUCCESSFUL

OBSERVING

PROPOSALS

- Chandra (PI: A. Basu-Zych, 2020) – *Luminous binaries at $z > 8$: Chandra detections in Primordial Galaxy Analogs*
- Chandra Large Proposal (PI: B. Lehmer, 2019) – *A Local Characterization of the $z \approx 10$ X-ray Radiation Field and Its Effects on Early IGM Heating*
- Chandra (PI: B. Lehmer, 2018) – *A Measurement of the 0.330 keV Spectrum of the Low-Metallicity Galaxy VV114*
- Chandra (PI: A. Basu-Zych, 2016) – *Too young to shine? Nearby Primordial Starbursts and the X-ray Scaling Relations in the Early Universe*
- Chandra (PI: B. Lehmer, 2016) – *A Close-Up Look at a $z = 10$ Galaxy Analog: A Deep Chandra Exposure of DDO68*
- NASA ADAP (PI: B. Lehmer, 2015) – *A First Robust Measurement of the Aging of Field Low Mass X-ray Binary Populations from Hubble and Chandra*
- Chandra (PI: B. Lehmer, 2015) – *Statistically Robust Constraints on Field LMXB Formation*
- ALMA (PI: T.S. Gonçalves, 2012, 2012.1.00607.S) – *Molecular Gas in Low-Metallicity Extreme Starburst galaxies*
- GEMINI NIRI (PI: T.S. Gonçalves, 2012) – *Near-Infrared Morphology of Low-Redshift Lyman Break Analogs*
- NASA ADAP (PI: B. Lehmer, 2012) – *A Subgalactic Multiwavelength Perspective on the Formation of X-ray Binary Populations: An In-Depth Study of Nearby Galaxies*
- Chandra (PI: A. Basu-Zych, 2011) – *Chandra Observations of Local Lyman Break Galaxy Analogs*
- Chandra (PI: B. Lehmer, 2011) – *Direct Chandra Constraints on the Evolution of Field LMXB Populations*
- EVLA (PI: A. Basu-Zych, 2011, Joint Observing with Chandra, B-array)

- EVLA (PI: J. Geach, 2011) – *Watching Galaxy Formation in Action: eVLA Observations of Lyman-Alpha Blobs*
- Hershel (PI: R. Overzier, 2010) – *Comparing the Dust Emission from High Redshift Lyman Break Galaxies with their Best Low Redshift Analogs discovered by GALEX*
- Swift (PI: A. Basu-Zych, 2010) – *Using Swift UVOT to Investigate Triggered Star formation in Close Pairs*
- EVLA (PI: S. Neff, 2010) – *Radio Properties of Local UV-Luminous Galaxies*
- CARMA (PI: T. S. Gonalves, 2009) – *Molecular Gas in Lyman Break Analogs*
- OSIRIS/Keck (PI: A. Basu-Zych, 2007 & 2008) – *Probing the Small-scale Kinematic Structure of Local Lyman Break Galaxy Analogs*
- Gemini (PI: A. Basu-Zych, 2007 & 2008) – *Probing the Small-scale Kinematic Structure of Local Lyman Break Galaxy Analogs*
- VLBI (PI: R. Overzier, 2008) – *Locating AGN in Local Analogs of High Redshift Lyman Break Galaxies*
- HST COS (PI: T. Heckman, 2008) – *UV spectroscopy of Local Lyman Break Galaxy Analogs: New Clues to Galaxy Formation in the Early Universe*
- HST (PI: R. Overzier, 2008) – *Lya Emission in Local Lyman Break Galaxy Analogs*
- GBT (PI: D. Schiminovich, 2008) – *Measuring the Neutral Gas in Local Lyman Break Galaxy Analogs*
- GALEX grism (PI: A. Basu-Zych, 2007) – *Demographics of Star-forming Galaxies*
- VLA (PI: D. Schiminovich, 2007) – *Local analogs of Lyman Break Galaxies: Radio Continuum from Star Formation*
- VLT FORS Spectrograph (PI: R. Overzier, 2007) – *Optical Spectroscopy of Local Lyman Break Galaxy Analogs: Low Redshift Lessons for High Redshift Galaxies*
- VLA (PI: A. Basu-Zych, 2006, C-array, 5GHz) – *Local Analogs to LBGs–Disentangling Thermal from Synchrotron Emission*

TEACHING
EXPERIENCE

- COLUMBIA UNIVERSITY 2005-2006
- *Teachers Assistant for Introductory Astronomy For Majors course*
– Led discussion for Introductory Astronomy course.
- COLUMBIA UNIVERSITY 2004 – 2005
- *Head TA*
– Managed lab instructors for teaching, grading exams for introductory Astronomy courses, maintained supplies and developed additional curriculum
- COLUMBIA UNIVERSITY 2002 – 2005
- *Astronomy Laboratory Instructor*
– Designed and taught hands-on astronomy lab course to non-majors. Graded and led help sessions for other Introductory Astronomy courses.
- CHABOT SPACE & SCIENCE CENTER 2001 – 2002
- *Astronomy Education Specialist*
– Developed and taught a high school astronomy curriculum, designed and conducted teacher workshops for middle school teachers in Optics.

PUBLIC
OUTREACH &
ASTRONOMY
COMMUNITY
SERVICE

- Research Supervisor for High School Student** in 2 year Science Research Program through joint sponsorship by Nyack High School & University of Albany June 2017 – 2019
- Research Supervisor for 2 high school students for Senior Projects** June 2017

Research Supervisor or Co-supervisor for 6 NASA interns 2013–2020
Guest Editor for *Galaxies* Special Issue June 2020 – current
X-ray binary formation and evolution – July 2021
Peer Reviewer for *ApJ*, *MNRAS*, and *Nature* on ~ 5 publications 2010–2020
Served on *Chandra* Time Allocation Committee as a Chair June 2019
Served on *Chandra* Time Allocation Committee June 2012 & June 2016
Served on Science Organizing Committee for 2019
***Chandra* 20 year Anniversary meeting**
Serving on Athena-LSST Synergy Committee for current
Acted as subject matter expert for NASA’s Universe 2019
of Learning program and helped to develop content for the
ViewSpace exhibit platform
Volunteer for NASA’s Ask an Astrophysicist September 2010 – October 2012
Served on *Swift* Time Allocation Committee December 2010
Guest Lecturer for OSHER JHU continued learning program October 2019
Girl’s Science Day Spring 2007, Fall 2007
Undergraduate Research Mentor Summer 2007
Mentor for Middle School student in Harlem, NY Spring 2006

INVITED TALKS

- AAS 235 (Honolulu, HI) Splinter session on *The Athena X-ray Mission: Multi-wavelength and Multi-messenger Opportunities*– “Athena-SKA synergy”
- University of Massachusetts, Amherst, Department of Astronomy Colloquium, April 2018, Amherst, MA – “Young galaxies in an old universe: A multiwavelength study into the misfits of our local universe”
- University of Arkansas Physics Department Colloquium, April 2017, Fayetteville, AK – “Secrets of youthful systems: Young galaxies in an Old Universe”
- Chandra 15 years Symposium, November 2014, Boston, MA – “X-ray Emission in Primordial Starbursts”
- Colloquium, March 2013, University of the Pacific, Stockton, CA – “Secrets to staying young: Young galaxies in an Old Universe”
- Astrophysics Colloquium, March 2010, NASA/GSFC, Greenbelt, MD – “Exploring the Nature of $z < 1$ Ultraviolet Luminous Galaxies (UVLGs): Local Analogs of Lyman Break Galaxies”
- IPAC Astronomy seminar, August 2008, Pasadena, CA – “Exploring the Nature of Ultraviolet Luminous Galaxies (UVLGs)”

PUBLIC TALKS

Astronomy on Tap (Washington D.C.) March, 2016
TALK: *Colossal Cosmic Collisions: The Spectacular Things That Happen When Galaxies Meet*
Public Lecture (Columbia U., NY) May, 2009

TALK: *The Violent Tendencies of Galaxies*

OTHER RELATED JOB EXPERIENCE	Chabot Space & Science Center <ul style="list-style-type: none">• <i>Astronomy Education Specialist</i><ul style="list-style-type: none">– (see Teaching Experience section for description)	2001 – 2002
	Globalstar(Lockhead Martin/Loral Space Systems) <ul style="list-style-type: none">• <i>Mission Analyst and Operations Command</i><ul style="list-style-type: none">– Commanded 52 low-orbit satellites for telecommunication purposes. Calculated and performed orbit corrections.	2000 – 2001

SELECTED
PUBLISHED &
SUBMITTED
ARTICLES

In summary: 38 peer-reviewed published and submitted papers (10 as first-author, and 28 others as co-author), as of September, 2020. These papers have received >2400 citations (first author papers were cited >300 times). Publication H-index is 23. Relevant published papers are listed below in reverse chronological order.

38. Basu-Zych, Antara R., Hornschemeier, Ann E., Haberl, Frank, Vulic, Neven, Wilms, Jörn, *et al.*, 2020, *MNRAS*, "The Next Generation X-ray Galaxy Survey with eROSITA"
37. Lehmer, Bret D., Ferrell, Andrew P., Doore, Keith, Eufrazio, Rafael T., Monson, *et al.*, 2020, *ApJS*, 248, 31, "X-Ray Binary Luminosity Function Scaling Relations in Elliptical Galaxies: Evidence for Globular Cluster Seeding of Low-mass X-Ray Binaries in Galactic Fields"
36. Lehmer, Bret D., Eufrazio, Rafael T., Tzanavaris, Panayiotis, Basu-Zych, Antara, Fragos, Tassos, *et al.*, *ApJS*, 243, 3, "X-Ray Binary Luminosity Function Scaling Relations for Local Galaxies Based on Subgalactic Modeling"
35. Lehmer, B. D., Eufrazio, R. T., Markwardt, L., Zezas, A., Basu-Zych, A., *et al.*, *ApJ*, 851, 11, "On the Spatially Resolved Star Formation History in M51. II. X-Ray Binary Population Evolution"
34. Eufrazio, R. T., Lehmer, B. D., Zezas, A., *et al.*, *ApJ*, 851, 10, "On the Spatially Resolved Star Formation History in M51. I. Hybrid UV+IR Star Formation Laws and IR Emission from Dust Heated by Old Stars"
33. Coulter D. A., Lehmer B. D., Eufrazio R. T., Kundu A., Maccarone T., *et al.* 2017, *ApJ*, 835, 183, "Testing the Universality of the Stellar IMF with Chandra and HST"
32. Luo B., Brandt W. N., Xue Y. Q., Lehmer B., Alexander D. M., *et al.*, 2017, *ApJS*, 228, 2, "The Chandra Deep Field-South Survey: 7 Ms Source Catalogs"
31. Vito F., Gilli R., Vignali C., Brandt W. N., Comastri A., *et al.*, 2016, *MNRAS*, 463, 348, "The deepest X-ray view of high-redshift galaxies: constraints on low-rate black hole accretion"
30. Fragos, T., Lehmer, B. D., Naoz, S., Zezas, A., Basu-Zych, A. 2016, *ApJ*, 827, L21, Erratum: "Energy Feedback from X-Ray Binaries in the Early Universe"; 2016*ApJ*, 827, 21
29. Lehmer B. D., **Basu-Zych A. R.**, Mineo S., Brandt W. N., Eufrazio R. T., *et al.* 2016, *ApJ*, 825, 7, "The Evolution of Normal Galaxy X-Ray Emission through Cosmic History: Constraints from the 6 MS Chandra Deep Field-South"
28. **Basu-Zych A. R.**, Lehmer B., Fragos T., Hornschemeier A., Yukita M., *et al.* 2016, *ApJ*, 818, 140, "Exploring the Overabundance of ULXs in Metal- and Dust-poor Local Lyman Break Analogs"(6 Citations)

27. Gonçalves, T. S., **Basu-Zych, A.**, Overzier, R. A., Pérez, L., & Martin, D. C. 2014, MNRAS, 442, 1429, “Molecular gas properties of UV-bright star-forming galaxies at low redshift”
26. Lehmer, B. D., Berkeley, M., Zezas, A., Alexander, D. M., **Basu-Zych, A.**, *et al.* 2014, ApJ, 789, 52, “The X-Ray Luminosity Functions of Field Low-mass X-Ray Binaries in Early-type Galaxies: Evidence for a Stellar Age Dependence”
25. Fragos, T., Lehmer, B. D., Naoz, S., Zezas, A., & **Basu-Zych, A.** 2013, ApJL, 776, L31, “Energy Feedback from X-Ray Binaries in the Early Universe”
24. **Basu-Zych, A. R.**, Lehmer, B. D., Hornschemeier, A. E., Gonçalves, T. S., Fragos, *et al.* 2013, ApJ, 774, 152, “Evidence for Elevated X-Ray Emission in Local Lyman Break Galaxy Analogs” (29 Citations)
23. Tzanavaris, P., Fragos, T., Tremmel, M., Jenkins, L., Zezas, A., Lehmer, B. D., *et al.* 2013, ApJ, 774, 136, “Modeling X-Ray Binary Evolution in Normal Galaxies: Insights from SINGS”
22. Tremmel, M., Fragos, T., Lehmer, B. D., Tzanavaris, P., Belczynski, K., *et al.* 2013, ApJ, 766, 19, “Modeling the Redshift Evolution of the Normal Galaxy X-Ray Luminosity Function”
21. Fragos, T., Lehmer, B., Tremmel, M., Tzanavaris, P., **Basu-Zych, A.**, *et al.* 2013, 764, 41, “X-ray Binary Evolution Across Cosmic Time”.
20. **Basu-Zych, A. R.**, Lehmer, B. D., Hornschemeier, A. E., Bouwens, R. J., Fragos, T., *et al.* 2013, ApJ, 762, 45, “The X-ray Star Formation Story as Told by Lyman Break Galaxies in the 4 Ms CDF-S”. (53 Citations)
19. Alexandroff, R., Overzier, R. A., Paragi, Z., **Basu-Zych, A.**, Heckman, T., *et al.* 2012, MNRAS, 2917, “A search for active galactic nuclei in the most extreme UV-selected starbursts using the European VLBI Network”
18. **Basu-Zych, A. R.**, Hornschemeier, A. E., Hoversten, E. A., Lehmer, B., & Gronwall, C., 2011, ApJ, 739, 98, “A Search for Lyman Break Galaxies in the Chandra Deep Field South Using Swift Ultraviolet/Optical Telescope” (10 citations)
17. Hoversten, E. A., Gronwall, C., Vanden Berk, D. E., **Basu-Zych, A. R.**, Breeveld, A. A., *et al.* 2011, AJ, 141, 205, “Swift Ultraviolet/Optical Telescope Imaging of Star-forming Regions in M81 and Holmberg IX”
16. Heckman, T. M., Borthakur, S., Overzier, R., Kauffmann, G., **Basu-Zych, A.**, *et al.* 2011, ApJ, 730, 5, “Extreme Feedback and the Epoch of Reionization: Clues in the Local Universe”
15. Overzier, R. A., Heckman, T. M., Wang, J., Armus, L., Buat, V., *et al.* 2011, ApJL, 726, L7, “Dust Attenuation in UV-selected Starbursts at High Redshift and Their Local Counterparts: Implications for the Cosmic Star Formation Rate Density”
14. Gonçalves, T. S., **Basu-Zych, A.**, Overzier, R., Martin, D. C., Law, D. R., Schiminovich, *et al.* 2010, ApJ, 724, 1373, “The Kinematics of Ionized Gas in Lyman-break Analogs at $z \sim 0.2$ ”
13. Schiminovich, D., Catinella, B., Kauffmann, G., Fabello, S., Wang, J., *et al.* 2010, MNRAS, 408, 919, “The GALEX Arecibo SDSS Survey - II. The star formation efficiency of massive galaxies”

12. Catinella, B., Schiminovich, D., Kauffmann, G., Fabello, S., Wang, J. *et al.* 2010, MNRAS, 403, 683, “The GALEX Arecibo SDSS Survey - I. Gas fraction scaling relations of massive galaxies and first data release”
11. Overzier, R. A., Heckman, T. M., Schiminovich, D., **Basu-Zych, A.**, Gonçalves, T., *et al.* 2010, ApJ, 710, 979, “Morphologies of Local Lyman Break Galaxy Analogs. II. A Comparison with Galaxies at $z \sim 2 - 4$ in ACS and WFC3 Images of the Hubble Ultra Deep Field”
10. Overzier, R. A., Heckman, T. M., Tremonti, C., Armus, L., **Basu-Zych, A.**, *et al.* 2009, ApJ, 706, 203, “Local Lyman Break Galaxy Analogs: The Impact of Massive Star-Forming Clumps on the Interstellar Medium and the Global Structure of Young, Forming Galaxies”
9. **Basu-Zych, A. R.**, 2009, Ph.D. Thesis, “Exploring the nature of $z < 1$ Ultraviolet Luminous Galaxies (UVLGs): Local analogs of Lyman Break Galaxies” (1 citation)
8. Geach, J. E., Alexander, D. M., Lehmer, B. D., Smail, I., Matsuda, Y., *et al.* 2009, ApJ, 700, 1, “The Chandra Deep Protocluster Survey: Ly α Blobs are Powered by Heating, Not Cooling”
7. **Basu-Zych, A. R.**, Gonçalves, T. S., Overzier, R., Law, D. R., Schiminovich, D., *et al.* 2009, ApJL, 699, L118, “An OSIRIS Study of the Gas Kinematics in a Sample of UV-Selected Galaxies: Evidence of ‘Hot and Bothered’ Starbursts in the Local Universe” (29 Citations)
6. **Basu-Zych, A. R.**, Schiminovich, D., Heinis, S., Overzier, R., Heckman, T., Zamojski, *et al.* 2009, ApJ, 699, 1307, “Studying Large- and Small-Scale Environments of Ultraviolet Luminous Galaxies” (9 citations)
5. Lehmer, B. D., Alexander, D. M., Geach, J. E., Smail, I., **Basu-Zych, A.**, *et al.* 2009, ApJ, 691, 687, “The Chandra Deep Protocluster Survey: Evidence for an Enhancement of AGN Activity in the SSA22 Protocluster at $z = 3.09$ ”
4. Seth, A., Agüeros, M., Lee, D., & **Basu-Zych, A.**, 2008, ApJ, 678, 116, “The Coincidence of Nuclear Star Clusters and Active Galactic Nuclei”
3. Overzier, R. A., Heckman, T. M., Kauffmann, G., Seibert, M., Rich, R. M., **Basu-Zych, A.**, *et al.* 2008, ApJ, 677, 37, “Hubble Space Telescope Morphologies of Local Lyman Break Galaxy Analogs. I. Evidence for Starbursts Triggered by Merging”
2. **Basu-Zych, A. R.**, Schiminovich, D., Johnson, B. D., Hoopes, C., Overzier, R., *et al.* 2007, ApJS, 173, 457, “The Young and the Dustless: Interpreting Radio Observations of Ultraviolet-Luminous Galaxies” (37 Citations)
1. **Basu-Zych, A.**, & Scharf, C., 2004, ApJL, 615, L85, “X-Ray Detection of an Obscured Active Galactic Nucleus in a $z = 3.09$ Radio-quiet Ly α Nebula” (52 Citations)