

# Amy Yarleen Lien

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## Research Interests and Relevant Skills

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Research Interests   Gamma-ray bursts and supernovae, time-domain astrophysics, multi-messenger studies, high-energy astrophysics, stellar evolution, early universe, cosmology

Relevant Skills     Fluently in C, Python, Shell Script. IDL, AWK, Xspec, FTOOLS.  
Experienced in Matlab, Mathematica, Fortran

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## Positions

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Sept 2017 – Present   Assistant Research Scientist<sup>1,2,\*</sup>,

Sept 2013 – Sept 2017   Postdoctoral Research Associate<sup>1,2,\*</sup>,

<sup>1</sup>NASA Goddard Space Flight Center

and Center for Space Science and Technology (CRESST),

<sup>2</sup>University of Maryland Baltimore County

\*80% time for supportive work of the *Swift* Burst Alert Telescope

20% time for personal research

Sept 2011 – Aug 2013   NASA Postdoctoral Fellow, NASA Goddard Space Flight Center

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## Education

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Aug 2005 – Aug 2011   Graduate student (PhD), Department of Astronomy,  
University of Illinois at Urbana-Champaign

Sept 2001 – June 2005   B.S. Department of Physics, National Central University (Taiwan)

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## Professional Experience

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### Sept 2011 – Present:

- Research:
  1. Exploring the connection between gamma-ray bursts (GRBs) and supernovae via multi-messenger observations. In particular, we developed a code that is capable of creating mock GRB light curves and simulating the BAT trigger algorithm. We use the code to study intrinsic GRB characteristics.
  2. Making forecasts for the future GRB/transient telescope, the Transient Astrophysics Observatories (TAO), and exploring optimal survey strategies to maximize detections of high-redshift GRBs and nearby short GRBs, which are potential counterparts of gravitational wave events.
- Supporting tasks for *Swift*/BAT:
  1. GRB-related tasks: Data analysis for the BAT-detected GRB, maintaining and updating the GRB catalog website (<http://swift.gsfc.nasa.gov/results/batgrbcatalog/>).
  2. Maintaining the BAT hard X-ray transient monitor scripts and webpages (<http://swift.gsfc.nasa.gov/results/transients/>), and providing data to HEASARC for public use.
  3. Providing BAT data analysis when required, and offering help for users who have questions regarding the BAT analysis.
  4. Maintaining the BAT-team machines, arranging shifts for the BAT burst scientists and the Goddard burst advocates.
  5. Writing new automatic scripts for new requests for the BAT operation, including prompt data search following gravitational wave triggers.

### Jan 2007 – Aug 2011

Advisor: Prof. Brian Fields, University of Illinois at Urbana-Champaign

- Code development for detailed forecasting of core-collapse supernova detections for major future surveys in both optical and radio wavelengths, and exploration of science potentials of the detections, such as precision measurement of the cosmic supernova rate and the diffuse supernova neutrino background, and probing failed supernovae via multi-messenger observations.

### May 2006 – Dec 2006

Advisor: Prof. Joseph Mohr, University of Illinois at Urbana-Champaign

- Code development for mock observations for the galaxy cluster search of the Dark Energy Survey, and seeking the optimal filter for galaxy cluster detections via SZ Effect.

### Jun 2004 – Dec 2004

Advisor: Prof. S. K. Lai, National Central University (Taiwan)

- Adaptation of molecular structure code to find minimum potentials for iron molecules.

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## Selected Publications

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\* See full publication list on the ADS search engine (<http://adsabs.harvard.edu>):

27 refereed and 500+ non-refereed (e.g., GCN circulars or ATELS) articles.

### Major publications:

1. *The Third Swift Burst Alert Telescope Gamma-Ray Burst Catalog*  
**Amy Lien**, Takanori Sakamoto, Scott D. Barthelmy et al.,  
The Astrophysical Journal, Vol. 829, Issue 1, article id 7, 47 pp. (2016)  
arXiv:1606.01956
2. *Modeling the Swift BAT Trigger Algorithm with Machine Learning*  
Philip B. Graff, **Amy Lien**, John G. Baker et al.,  
The Astrophysical Journal, Vol. 818, Issue 1, article id. 55, 10 pp. (2016)  
arXiv:1509.01228
3. *Swift Observations of Gamma-Ray Burst Pulse Shapes: GRB Pulse Spectral Evolution Clarified*  
Jon Hakkila, **Amy Lien**, Takanori Sakamoto et al.,  
The Astrophysical Journal, Vol. 815, Issue 2, article id. 134, 16 pp. (2015)
4. *Probing the Cosmic Gamma-ray Bursts Rate  
with Trigger Simulations for the Swift Burst Alert Telescope*  
**Amy Lien**, Takanori Sakamoto, Neil Gehrels, et al.  
The Astrophysical Journal, vol. 783, Issue 1, article id. 24, 22 pp. (2014)  
arXiv:1311.4567
5. *The Diffuse Gamma-ray Background from Type Ia Supernovae*  
**Amy Lien**, Brian D. Fields  
The Astrophysical Journal, vol. 747, Issue 2, article id. 120, 12 pp. (2012)  
arXiv:1201.3447
6. *Radio Supernovae in the Great Survey Era*  
**Amy Lien**, Nachiketa Chakraborty, Brian D. Fields, and Athol Kemball  
Astrophysical Journal, vol. 740, Issue 1, id. 23 (2011)  
arXiv:1107.0775
7. *Synoptic Sky Surveys and the Diffuse Supernova Neutrino Background:  
Removing Astrophysical Uncertainties and Revealing Invisible Supernovae*  
**Amy Lien**, Brian D. Fields, and John F. Beacom  
Physical Review D, vol. 81, Issue 8, id. 083001 (2010)  
arXiv:1001.3678
8. *Cosmic Core-Collapse Supernovae from Upcoming Sky Surveys*  
**Amy Lien** and Brian D. Fields

Journal of Cosmology and Astroparticle Physics, Issue 01, pp. 047 (2009)  
arXiv:0902.0979

### Other selected publications:

9. *Swift Follow-up of Gravitational Wave Triggers: Results from the First aLIGO run and Optimization for the Future*  
Phil A. Evans, et al., MNRAS, Vol. 462, Issue 2, p.1591-1602 (2016)
10. *An Achromatic Break in the Afterglow of the Short GRB 140903A: Evidence for a Narrow Jet*  
Eleonora Troja et al., ApJ. Vol. 827, Issue 2, article id. 102, 12 pp. (2016)
11. *Do the Fermi Gamma-Ray Burst Monitor and Swift Burst Alert Telescope see the Same Short Gamma-Ray Bursts?*  
Eric Burns et al. ApJ. Vol. 818, Issue 2, article id. 110, 10 pp. (2016)
12. *The Central Engine of GRB 130831A and the Energy Breakdown of a Relativistic Explosion*  
Massimiliano De Pasquale et al., MNRAS, Vol. 455, Issue 1, p. 1027-1042 (2016)
13. *Happy Birthday Swift: Ultra-long GRB 141121A and Its Broadband Afterglow*  
Antonino Cucchiara et al. ApJ, Vol. 812, Issue 2, article id. 122, 13 pp. (2015)
14. *iPTF14yb: The First Discovery of a Gamma-Ray Burst Afterglow Independent of a High-energy Trigger*  
Brad S. Cenko et al., ApJ Letters, Vol 803, Issue 2, L24, 6 (2015)
15. *GRB 130925A: an ultralong gamma ray burst with a dust-echo afterglow, and implications for the origin of the ultralong GRBs*  
Phil A. Evans et al., MNRAS, Vol. 444, Issue 1, p.250-267 (2014)
16. *The Swift/BAT Hard X-Ray Transient Monitor*  
Krimm et al., ApJS, Volum 209, Issue 1, article id. 14, 33 pp. (2013)
17. *Core-Collapse Supernovae*  
**Amy Lien** and Brian D. Fields  
LSST Science Book contribution, pp. 401-403 (2009)  
Online version: <http://www.lsst.org/lsst/scibook>

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### Principal Investigator Research Grants

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| <ul style="list-style-type: none"> <li>• Quantifying the Instrumental Effects and Systematic Uncertainties in the Durations of <i>Swift</i>/BAT Gamma-ray Bursts<br/>- Swift Guest Investigator Program (Cycle 13): \$40K</li> </ul> | 2017-2018 |
| <ul style="list-style-type: none"> <li>• Chasing Short Gamma-Ray Bursts with Swift and Fermi<br/>- Swift Guest Investigator Program (Cycle 10): \$39K</li> </ul>   | 2014-2016 |
| <ul style="list-style-type: none"> <li>• High Redshift Gamma-Ray Bursts from Swift<br/>- Swift Guest Investigator Program (Cycle 9): \$33.5K</li> </ul>  | 2013-2014 |

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### Invited Talks

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<u>Oct 2017</u>	CTC seminar, University of Maryland, College Park Title: Gamma-ray Bursts from the Swift Burst Alert Telescope
<u>Dec 2016</u>	Astroparticle Physics Workshop at Yachay Tech, Quito, Ecuador Title: Gamma-ray Bursts from the Swift Burst Alert Telescope
<u>Oct 2016</u>	The Eighth Huntsville Gamma-Ray Burst Symposium, Huntsville, Alabama Title: The Third Swift Burst Alert Telescope Gamma-Ray Burst Catalog: Instrumental Sensitivity and Implication on the High-Redshift GRBs
<u>Dec 2015</u>	The Fourth AMON workshop, Penn State University, Pennsylvania Title: Swift-BAT as a Triggering Facility
<u>Sept 2015</u>	Special Seminars, CEA Saclay, France Title: Gamma-ray Bursts from the Swift Burst Alert Telescope: Probing Intrinsic Distributions with Trigger Simulations
<u>Apr 2015</u>	Astronomical Sciences Seminars, Virginia Tech, Virginia Title: Probing the Star-Formation History with Core-Collapse Supernovae, Gamma-Ray Bursts, and Neutrinos in the Great Survey Era
<u>Apr 2015</u>	ITC Seminar, CfA, Harvard University, Boston Title: Gamma-ray Bursts from the Swift Burst Alert Telescope: Probing Intrinsic Distributions with Trigger Simulations
<u>Jan 2015</u>	Seminar, Academia Sinica, Taiwan Title: Ten Years of Swift: The Third Swift Burst Alert Telescope Gamma-Ray Burst Catalog
<u>July 2013</u>	Seminar, Academia Sinica, Taiwan Title: Connecting Core-Collapse Supernovae and Gamma-Ray Bursts in the Great Survey Era
<u>July 2013</u>	Seminar, National Central University, Taiwan Title: Connecting Core-Collapse Supernovae and Gamma-Ray Bursts in the Great Survey Era
<u>Feb 2012</u>	Seminar, Naval Research Laboratory Title: Core-Collapse Supernovae in the Great Survey Era
<u>Aug 2011</u>	Seminar, National Tsing-Hua University, Taiwan Title: Core-Collapse Supernovae in the Great Survey Era
<u>July 2011</u>	Seminar, Goddard Space Flight Center Title: Revealing Optically Invisible Core-Collapse Supernovae in the Great Survey Era

- Apr 2011      The Second Annual CCAPP Symposium, Ohio State University  
                     Title: Core-Collapse Supernovae in the Great Survey Era:  
                                  Impact on Particle Astrophysics and Cosmology
- Feb 2011      Triangle Nuclear Theory Colloquium, North Carolina State University  
                     Title: Core-Collapse Supernovae in the Great Survey Era:  
                                  Impact on Particle Astrophysics and Cosmology

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### Mentoring Experience

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- Summer 2017      GRB pulse-shape study  
                                  Student: Juan-Carlos Martinez, University of the Virgin Islands
- Fall 2016      Spectral joint-fit analysis for GRBs from *Swift*/BAT and *Suzaku*/WAM  
                                  Student: Austin Kim, University of Maryland at College Park
- Fall 2016      Probing star-formation rate with Bayesian analysis of Swift GRBs (co-mentor)  
                                  Student: Anjali Mittu, University of Maryland at College Park
- Summer 2016      GRB pulse-shape study  
                                  Student: Jared Hanley, University of the Virgin Islands
- Summer 2015      Chasing short GRBs with *Swift* and *Fermi*  
                                  Student: Charles Law, Harvard University
- Summer 2015      GRB pulse-shape study (co-mentor)  
                                  Student: Jason Baron, University of the Virgin Islands
- Summer 2014      High redshift GRBs from *Swift*  
                                  Student: Kevin Chen, University of California, Berkeley
- Summer 2014      Chasing short GRBs with *Swift* and *Fermi* (co-mentor)  
                                  Student: John Kerin, Georgetown University

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### Teaching Experience (instructor)

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- Fall 2017      Special Projects in Astronomy: Astronomy Research Techniques  
                                  (ASTR288C), University of Maryland, College Park  
                                  Website: [https://userpages.umbc.edu/~alien/ASTR\\_288C/Index.html](https://userpages.umbc.edu/~alien/ASTR_288C/Index.html)

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### Teaching Experience (teaching assistant)

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- Fall 2010      TA for Phys 598 (Topics in Computational Physics and Astrophysics)  
                                  Instructor: Prof. Stuart Shapiro
- Summer 2009      TA for Astro100 (Perspectives to Astronomy)  
                                  Instructor: Dr. Ashley Ross
- Spring 2009      TA for Astro330 (Extraterrestrial Life) with discussion sections

<u>Fall 2008</u>	Instructor: Prof. Leslie Looney TA for Astro121* (The Solar System) with discussion sections
<u>Summer 2008</u>	Instructor: Prof. Edmund Sutton TA for Astro100 (Perspectives in Astronomy)
<u>Spring 2008</u>	Instructor: Dr. Ashley Ross TA for Astro596 (Physical Cosmology)
<u>Fall 2007</u>	Instructor: Prof. Brian Fields TA for Astro502 (Theory Diffuse Matter Dynamics)
<u>Spring 2007</u>	Instructor: Prof. Charles Gammie TA for Astro330 (Extraterrestrial Life)
<u>Spring 2006</u>	Instructor: Prof. Leslie Looney TA for Astro405 (Solar System and Interstellar Medium)
<u>Fall 2005</u>	Instructor: Prof. Ronald Webbink TA for Astro100* (Perspectives to Astronomy)
	Instructor: Prof. Thomasanna Hail TA for Astro100* (Perspectives in Astronomy)
	Instructor: Prof. Laird Thompson

\* Classes including night observing sections and solar observing sections.

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### Community Service and Outreach

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- Representing the *Swift* telescope at the NASA Science Jamborees, the American Astronomical Society (AAS) meetings, and the NASA Goddard Open House
  - Serving as a referee for academic journals
  - Serving as a reviewer for grant proposals
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### References

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Dr. Takanori Sakamoto	Department of Physics and Mathematics, College of Science and Engineering, Aoyama Gakuin University Address: 5-10-1 Fuchinobe, Chuo-ku, Sagamihara-shi, Kanagawa 252-5258, Japan Email: <a href="mailto:tsakamoto@phys.aoyama.ac.jp">tsakamoto@phys.aoyama.ac.jp</a> Phone: +81-42-759-6275
Dr. Neil Gehrels	NASA Goddard Space Flight Center, Code 661 Address: 8800 Greenbelt Rd, Greenbelt Rd, Greenbelt, MD 20771 Email: <a href="mailto:neil.gehrels@nasa.gov">neil.gehrels@nasa.gov</a>

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