

Geoffrey Ryan

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Citizenship: Canadian

EDUCATION

- 2017 Ph.D. Physics, New York University, Advisor: Andrew MacFadyen
Thesis: Numerical Simulations Of Black Hole Accretion
- 2011 M.Sc. Physics, University of Alberta, Advisor: Alexander Penin
Thesis: The High Energy Logarithms in Two Loop Electroweak Bhabha Scattering
- 2009 B.Sc. (Hons) Mathematical Physics, University of Alberta

PROFESSIONAL APPOINTMENTS

- 2017-2020 Joint Space-Science Institute Prize Fellow
University of Maryland College Park & NASA Goddard Space Flight Center
- 2020-2021 Postdoctoral Associate, Astroparticle Physics Lab
University of Maryland College Park & NASA Goddard Space Flight Center
- 2021- Postdoctoral Researcher
Perimeter Institute for Theoretical Physics

PUBLICATIONS

Journal Articles

- 2023 van Eerten, H. and **Ryan, G.** "Scaling relations for gamma-ray burst afterglow light curves and centroid motion independent of jet structure and dynamics"
MNRAS submitted, 2023, [arXiv:astro-ph/2310.08952]
- 2023 Dittmann, A. and **Ryan, G.**
"The Evolution of Accreting Binaries: from Brown Dwarfs to Supermassive Black Holes"
ApJ submitted, 2023, [arXiv:astro-ph/2310.07758]
- 2023 **Ryan, G.**, van Eerten, H., Troja, E., Piro, L., O'Connor, B., and Ricci, R.
"Modelling of Long-Term Afterglow Counterparts to Gravitational Wave Events: The Full View of GRB 170817A" *ApJ* submitted, 2023, [arXiv:astro-ph/2310.02328]
- 2023 Gianfagna, G., Piro, L., Pannarale, F., van Eerten, H., Ricci, F., **Ryan, G.**,
"Potential biases and prospects for the Hubble constant estimation via electromagnetic and gravitational-wave joint analyses" *MNRAS* submitted, 2023, [arXiv:astro-ph/2309.17073]

- 2023 Yang, Y., Troja, E., O'Connor, B., Fryer, C., Im, M., Durbak, J., Paek, G., Ricci, R., De Bom, C., Gillanders, J., Castro-Tirado, A., Peng, Z., Dichiarà, S., **Ryan, G.**, van Eerten, H., Dai, Z., Chang, S., Choi, H., De, K., Hu, Y., Kilpatrick, C., Kuttyrev, A., Jeong, M., Lee, C., Makler, M., Navarete, F., and Pérez-García, I.
"A lanthanide-rich kilonova in the aftermath of a long gamma-ray burst"
Nature submitted, 2023, [arXiv:astro-ph/2308.00638]
- 2023 Hinds, K.R., Oates, S., Nicholl, M., Patel, J., Omodei, N., Gompertz, B., Racusin, J., and **Ryan, G.** "Evidence for a luminosity-decay correlation in GRB GeV light curves"
MNRAS 526 (2023), 3, 3400-3406 [arXiv:astro-ph/2309.08493]
- 2023 Gianfagna, G., Piro, L., Pannarale, F., Van Eerten, H., Ricci, F., **Ryan, G.**, and Troja, E.
"Joint analysis of gravitational-wave and electromagnetic data of mergers: breaking an afterglow model degeneracy in GW170817 and in future events"
MNRAS 512 (2023), 3, 4771-4784 [arXiv:astro-ph/2212.01104]
- 2023 O'Connor, B., Troja, E., **Ryan, G.**, Beniamini, P., van Eerten, H., Granot, J., Dichiarà, S., Ricci, R., Lipunov, V., Gillanders, J., Gill, R., Moss, M., Anand, S., Andreoni, I., Becerra, R., Buckley, D., Butler, N., Cenko, S.B., Chasovnikov, A., Durbak, J., Francile, C., Hammerstein, E., van der Horst, A., Kasliwal, M., Kouveliotou, C., Kuttyrev, A., Lee, W., Srinivasaragavan, G., Topolev, V., Watson, A., Yang, Y., and Zhirkov, K.
"A structured jet explains the extreme GRB 221009A"
Sci. Adv. 9 (2023), 23, 1405 [arXiv:astro-ph/2302.07906]
- 2023 Dittmann, A., **Ryan, G.**, and Miller, M.C.
"The Decoupling of Binaries from Their Circumbinary Disks"
ApJL 949 (2023), 2, L30 [arXiv:astro-ph/2303.16204]
- 2022 Troja, E., Fryer, C. L., O'Connor, B., **Ryan, G.**, Dichiarà, S., Kumar, A., Ito, N., Gupta, R., Wollaeger, R. T., Norris, J. P., Kawai, N., Butler, N. R., Aryan, A., Misra, K., Hosokawa, R., Murata, K. L., Niwano, M., Pandey, S. B., Kuttyrev, A., van Eerten, H. J., Chase, E. A., Hu, Y. -D., Caballero-Garcia, M. D., and Castro-Tirado, A. J.
"A nearby long gamma-ray burst from a merger of compact objects"
Nature 612 (2022), 7939, 228-231 [arXiv:astro-ph/2209.03363]
- 2022 Neill, D., Tsang, D., van Eerten, H., **Ryan, G.**, and Newton, W. G.
"Resonant shattering flares in black hole-neutron star and binary neutron star mergers"
MNRAS 514 (2022), 4, 5385-5402 [arXiv:astro-ph/2111.03686]
- 2022 Dittmann, A., and **Ryan, G.** "A Survey of Disc Thickness and Viscosity in Circumbinary Accretion: Binary Evolution, Variability, and Disc Morphology"
MNRAS 513 (2022), 4, 6158-6176 [arXiv:astro-ph/2201.07816]
- 2022 Dichiarà, S., Troja, E., Lipunov, V., Ricci, R., Oates, S. R., Butler, N. R., Liuzzo, E., **Ryan, G.**, O'Connor, B., Cenko, S. B., Cosentino, R. G., Lien, A. Y., Gorbovskoy, E., Tyurina, N., Balanutsa, P., Vlasenko, D., Gorbunov, I., Podesta, R., Podesta, F., Reboloto, R., Serra, M., and Buckley, D. A. H. "The early afterglow of GRB 190829A"
MNRAS 512 (2022), 2, 2337-2349 [arXiv:astro-ph/2111.14861]
- 2022 Troja, E., O'Connor, B., **Ryan, G.**, Piro, L., Ricci, R., Zhang, B., Piran, T., Bruni, G., Cenko, S. B., and van Eerten, H.
"Accurate flux calibration of GW170817: is the X-ray counterpart on the rise?"
MNRAS 510 (2022), 2, 1902-1909 [arXiv:astro-ph/2104.13378]

- 2021 Dittmann, A., and **Ryan, G.**
 “Preventing Anomalous Torques in Circumbinary Accretion Simulations”
ApJ 921 (2021), 1, 71 [arXiv:astro-ph/2102.05684]
- 2021 Ahumada, T., Singer, L., Anand, S., Coughlin, M., Kasliwal, M., **Ryan, G.**, Andreoni, I., Cenko, S. B., Fremling, C., Kumar, H., Pang, P., Burns, E., Cunningham, V., Dichiarà, S., Dietrich, T., Svinkin, D., Almualla, M., Castro-Tirado, A., De, K., Dunwoody, R., Gatkine, P., Hammerstein, E., Iyyani, S., Mangan, J., Perley, D., Purkayastha, S., Bellm, E., Bhalerao, V., Bolin, B., Bulla, M., Cannella, C., Chandra, P., Duev, D., Frederiks, D., Gal-Yam, A., Graham, M., Ho, A., Hurley, K., Karambelkar, V., Kool, E., Kulkarni, S. R., Mahabal, A., Masci, F., McBreen, S., Pandey, S., Reusch, S., Ridnaia, A., Rosnet, P., Rusholme, B., Carracedo, A., Smith, R., Soumagnac, M., Stein, R., Troja, E., Tsvetkova, A., Walters, R., and Valeev, A.
 “Discovery And Confirmation Of The Shortest Gamma-Ray Burst From A Collapsar”
Nature Astronomy 5 (2021), 917-927, [arXiv:astro-ph/2105.05067]
- 2021 Dichiarà, S., Troja, E., Beniamini, P., O’Connor, B., Moss, M., Lien, A. Y., Ricci, R., Amati, L., **Ryan, G.**, and Sakamoto, T.
 “Evidence of Extended Emission in GRB 181123B and Other High-redshift Short GRBs”
ApJ 911 (2021), 2, L28, [arXiv:astro-ph/2103.02558]
- 2021 O’Connor, B., Troja, E., Dichiarà, S., Chase, E., **Ryan, G.**, Cenko, S., Fryer, C., Ricci, R., Marshall, F., Kouveliotou, C., Wollaeger, R., Fontes, C., Korobkin, O., Gatkine, P., Kuttyrev, A., Veilleux, S., Kawai, N., and Sakamoto, T.
 “A Tale Of Two Mergers: Constraints On Kilonova Detection In Two Short GRBs at $z \sim 0.5$ ”
MNRAS 501 (2021), 1, 1279-1298, [arXiv:astro-ph/2012.00026]
- 2021 Kelly, B. J., Eteinne, Z. B., Golomb, J., Schnittman, J. D., Baker, J. G., Noble, S. C., and **Ryan, G.** “Electromagnetic Emission from a Binary Black Hole Merger Remnant in Plasma: Field Alignment and Plasma Temperature”,
Phys. Rev. D 103 (2021), 6, 063039 [arXiv:astro-ph/2010.11259]
- 2020 Cunningham, V., Cenko, S.B., **Ryan, G.**, Vogel, S., Corsi, A., Cucchiara, A., Fruchter, A., Hoeshe, A., and Kangas, T., Kocevski, D., Perley, D., and Racusin, J.
 “GRB 160625B: Evidence for a Gaussian-Shaped Jet”,
ApJ 904 (2020), 2, 166, [arXiv:astro-ph/2009.00579]
- 2020 Troja, E., van Eerten, H., Zhang, B., **Ryan, G.**, Piro, L., Ricci, R., O’Connor, B., Wieringa, M. H., Cenko, S. B., and Sakamoto, T. “A thousand days after the merger: continued X-ray emission from GW170817” *MNRAS* 498 (2020) 4 5643-5651, [arXiv:astro-ph/2006.01150]
- 2020 **Ryan, G.**, van Eerten, H., Piro, L., and Troja, E.
 “Gamma-Ray Burst Afterglows In The Multi-Messenger Era: Numerical Models and Closure Relations”
ApJ 896 (2020), 2, 166 [arXiv:astro-ph/1909.11691]
- 2019 Troja, E., Castro-Tirado, A.J., Becerra Gonzalez, J., Hu, Y., **Ryan, G.S.**, Cenko, S.B., Ricci, R., Novara, G., Sanchez-Ramirez, R., Acosta-Pulido, J.A., Caballero Garcia, M.D., Guziy, S., Jeong, S., Lien, A.Y., Marquez, I., Pandey, S.B., Park, I.H., Tello, J.C., Sakamoto, T., Sokolov, I.V., Sokolov, V.V., Tiengo, A., Valeev, A.F., Zhang, B.B., and Veilleux, S.
 “The Afterglow And Kilonova Of The Short GRB 160821B”
MNRAS 489 (2019) 2104-2116, [arXiv:astro-ph/1905.01290]
- 2019 Troja, E., van Eerten, H., **Ryan, G.**, Ricci, R., Burgess, J.M., Wieringa, M., Piro, L., Cenko, S.B., and Sakamoto, T. “A Year In The Life Of GW170817: The Rise And Fall Of A Structured Jet From A Binary Neutron Star Merger” *MNRAS* 489 (2019) 1919-1926, [arXiv:astro-ph/1808.06617]

- 2019 Piro, L., Troja, E., Zhang, B., **Ryan, G.**, van Eerten, H., Ricci, R., Wieringa, M. H., Tiengo, A., Butler, N.R., Cenko, S.B., Fox, O.D., Kandrika, H.G., Novara, G., Rossi, A., and Sakamoto, T. "A Long-Lived Neutron Star Merger Remnant In GW170817: Constraints And Clues From X-Ray Observations" *MNRAS* 483 (2019) 1912-1921, [arXiv:astro-ph/1810.04664]
- 2018 Troja, E., **Ryan, G.**, Piro, L., van Eerten, H., Cenko, S.B., Yoon, Y., Lee, S.K., Im, M., Sakamoto, T., Gatkine, P., Kutyrev, A., and Veilleux, S. "A Luminous Blue Kilonova And An Off-Axis Jet From A Compact Binary Merger At $z = 0.1341$ " *Nature Communications* 9 (2018) id. 4089, [arXiv:astro-ph/1806.10624]
- 2018 Troja, E., Piro, L., **Ryan, G.**, van Eerten, H., Ricci, R., Wieringa, M.H., Lotti, S., Sakamoto, T., and Cenko, S.B. "The Outflow Structure Of GW170817 From Late-Time Broad-Band Observations" *MNRAS* 478 (2018) L18-L23, [arXiv:astro-ph/1801.06516]
- 2017 **Ryan, G.**, and MacFadyen, A. "Minidisks in Binary Black Hole Accretion" *ApJ* 835 (2017) 199, [arXiv:astro-ph/1611.00341]
- 2015 **Ryan, G.**, van Eerten, H., MacFadyen, A., and Zhang, B.B. "Gamma Ray Bursts Are Observed Off-Axis." *ApJ* 799 (2015) 3, [arXiv:astro-ph/1405.5516]
- 2015 Zhang, B.B., van Eerten, H., Burrows, D., **Ryan, G.**, Evans, P.A., Racusin, J., Troja, E., and MacFadyen, A. "Revisiting The GRB Jet-Break Problem With CHANDRA Deep Follow-up Data." *ApJ* 806 (2015) 15, [arXiv:astro-ph/1405.4867]
- 2011 Penin, A., and **Ryan, G.** "Two-Loop Electroweak Corrections To High Energy Large-Angle Bhabha Scattering." *JHEP* 1111 (2011) 081, [arXiv:hep-ph/1112.2171]

White Papers and Proceedings

- 2022 Piro, L., Ahlers, M., Coleiro, A., Colpi, M., de Oña Wilhelmi, E., Guainazzi, M., Jonker, P. G., McNamara, P., Nichols, D. A., O'Brien, P., Troja, E., Vink, J., Aird, J., Amati, L., Anand, S., Bozzo, E., Carrera, F. J., Fabian, A. C., Fryer, C., Hall, E., Korobkin, O., Korol, V., Mangiagli, A., Martínez-Núñez, S., Nissanke, S., Osborne, J., Padovani, P., Rossi, E. M., **Ryan, G.**, Sesana, A., Stratta, G., Tanvir, N., and van Eerten, H. "Athena synergies in the multi-messenger and transient universe" *Experimental Astronomy* 54 (2022) 1 23-117 [arXiv:astro-ph/2110.15677]
- 2019 Kara, E., Margutti, R., Keivani, A., Fong, W., Cenko, B., Noble, S., Mushotzky, R., Burns, E., **Ryan, G.**, Ruan, J., Haggard, D., Burrows, D., Fox, D., and Caputo, R. "X-ray follow-up of extragalactic transients" *Astro2020: Decadal Survey, Science White Paper no. 112* *BAAS* 51 (2019) 3 id.112 [arXiv:astro-ph/1903.05287]
- 2013 **Ryan, G.**, van Eerten, H., and MacFadyen, A. "Fitting Afterglows With Multi-Dimensional Simulations." in *Proceedings of the 7th Huntsville Gamma-Ray Burst Symposium, Nashville, Tennessee, USA, 2013*, edited by N. Gehrels, M. S. Briggs and V. Connaughton, eConf C1304143, 30, 2013

Codes

- afterglowpy Gamma ray burst afterglow models in Python, lead developer
- ScaleFit Gamma ray burst afterglow parameter estimation, lead developer
- disco Massively parallel moving mesh GRMHD, co-developer

TEACHING EXPERIENCE

New York University

- 2016 Graduate Computational Physics, General Relativity
- 2014 Graduate Computational Physics
- 2013 Graduate Quantum Mechanics II
- 2012 Graduate Quantum Mechanics I, Introductory Experimental Physics II

University of Alberta

- 2011 Physics 146
- 2010 Physics 144, Physics 126
- 2009 Physics 124

OBSERVING PROPOSALS

- 2023 HST Cycle 31 "Understanding the Hubble tension and jet physics through joint electromagnetic and gravitational wave observations of a neutron star merger"
PI O'Connor, 28 orbits
- 2023 HST Cycle 31 "GOTCHA! Gravitational wave counterparts Observed wiTh CHAndra"
PI Troja, 16 orbits
- 2023 HST Cycle 31 "A holistic view of compact binary mergers: from kilonova to afterglow"
PI Troja, 24 orbits
- 2020 VLA Semester 22B "Electromagnetic counterparts to gravitational wave events"
PI Troja, 48 hrs
- 2022 VLA Semester 22B "The collimation and energetics of short gamma-ray bursts"
PI Troja, 11.75 hrs
- 2022 HST Cycle 30 "GOTCHA! Gravitational wave counterparts Observed wiTh CHAndra"
PI Troja, 16 orbits
- 2021 VLA Semester 21 "Beyond the GRB jet: searching for the remnant of a neutron star merger"
PI Troja, 11.5 hrs
- 2021 HST Cycle 29 "Identifying the fingerprints of r-process heavy metals in a short GRB"
PI Troja, 11 orbits
- 2020 VLA Semester 20B "The collimation and energetics of short gamma-ray bursts"
PI Troja, 6 hrs
- 2020 VLA Semester 20A "Electromagnetic counterparts to gravitational wave events"
PI Troja, 29 hrs
- 2020 ATCA "Late-time emergence of the radio kilonova of GW₁₇₀₈₁₇" PI Piro
- 2020 GMRT Cycle 38 "Electromagnetic counterparts of Gravitational Wave events: radio follow-up with uGMRT" PI Troja, 4.5 hrs
- 2019 GMRT Cycle 37 "Electromagnetic counterparts of Gravitational Wave events: radio follow-up with uGMRT" PI Troja, 20 hrs

- 2019 GMRT Cycle 36 'Electromagnetic counterparts of Gravitational Wave events: radio follow-up with uGMRT' PI Troja, 9 hrs
- 2018 ATCA "The relativistic outflow of GW170817 and the nature of the central remnant with ATCA" PI Piro
- 2018 ATCA "Probing the relativistic outflow of GW170817 with ATCA" PI Piro
- 2018 CXO Cycle 20 "Electromagnetic Counterparts To Gravitational Wave Sources: A Synergistic Follow-Up With Chandra And The VLA" PI Troja, 350 ks CXO & 19.3 hrs VLA
- 2018 XMM-Newton AO 18 "Observing The Gravitational Wave Sky With XMM-Newton" PI Piro, 330 ks XMM, 150ks NuSTAR, & 3 hrs VLA

TALKS

- 2022 "A Binary Talk About Binaries" Summer Seminar Series on Gas Dynamics and Gravity
Clemson University, Clemson, South Carolina, USA. June 24
- 2021 "Two Problems Only Computers Can Solve" Strong Gravity Seminar
Perimeter Institute, Waterloo, Ontario, Canada. September 16
- 2020 "GRB Jets At All Angles" Strong Gravity Seminar
Perimeter Institute, Waterloo, Ontario, Canada. November 26
- 2020 "Structured Jets At All Angles" Observational Astronomy Meeting
CIERA Northwestern University, Evanston, Illinois, USA. February 10
- 2019 "Structured Jets At All Angles" Astrophysics Seminar
University of Bath, Bath, United Kingdom. December 11
- 2019 "Structured Jets At All Angles" Director's Seminar
Goddard Space Flight Center, Greenbelt, Maryland, USA. October 11
- 2018 "The Afterglows Of Structured Jets" JSI Mini-Symposium
University of Maryland, College Park, Maryland, USA. November 2
- 2017 "Lighting Up Accretion Disks With Binary Black Holes" Astronomy Colloquium
University of Maryland, College Park, Maryland, USA. September 13
- 2014 "Gamma-Ray Bursts Are Observed Off-Axis." Institute for Theory and Computation Seminar
Harvard-Smithsonian Center for Astrophysics, Cambridge, Massachusetts, USA. September 23

CONFERENCE AND WORKSHOP PARTICIPATION

- 2023 Invited Talk: "Theory And Simulation of GRB Jets"
GRB 50, The Past, Present, and Future of Gamma-Ray Bursts
Warrenton, Virginia, USA. August 28 - August 30
- 2023 Poster: "Modelling the Long-Term Electromagnetic Counterparts to Gravitational Wave Events"
HEAD 20: Meeting of the High Energy Astrophysics Division
Waikoloa, HI, USA. March 26 - March 30

- 2022 Talk: "GRB Afterglows In Full View"
GW Universe Workshop 6, Center for the Gravitational-Wave Universe
Seoul National University, Seoul, South Korea. November 10
- 2019 Talk: "Structured Jets At All Angles"
30th Texas Symposium On Relativistic Astrophysics
Portsmouth, United Kingdom. December 15 - December 20
- 2019 Talk: "Structured Jets At All Angles"
Yamada Conference LXXI: Gamma-ray Bursts in the Gravitational Wave Era 2019
Yokohama, Kanagawa, Japan. Oct 28 - Nov 1
- 2019 Poster: "Structured Jets At All Angles"
Astrophysics With Gravitational-Wave Populations
Aspen Center For Physics, Aspen, Colorado, USA. February 9-February 15
- 2019 Talk: "Structured Jets and GW170817A"
Physics and Astrophysics at the eXtreme (PAX) V
State College, Pennsylvania, USA. February 7
- 2018 Poster: "The Afterglows Of Structured Jets"
JSI - Gravitational Wave Physics And Astronomy Workshop
College Park, Maryland, USA. December 1-December 4
- 2017 Dissertation Talk: "Black Hole Accretion Discs on a Moving Mesh"
American Astronomical Society Meeting 229
Grapevine, Texas, USA. January 3-January 7
- 2016 Time-Domain Astrophysics: Incorporating Observations, Theory, and Computation
Radcliffe Institute for Advanced Study, Cambridge, USA. November 17-November 18
- 2016 Poster "Minidisks in Circumbinary Black Hole Accretion"
21st International Conference on General Relativity and Gravitation
Columbia University, New York City, USA. July 10-July 15
- 2014 International Summer School on Astro-Computing - Nuclear and Neutrino Astrophysics
San Diego Supercomputing Center, University of California, San Diego, USA. July 21-August 1
- 2013 Poster "Fitting Afterglows With Multi-Dimensional Simulations."
7th Huntsville Gamma-Ray Burst Symposium, Nashville, Tennessee, USA. April 14-18
- 2011 Science Communication Workshop
Arthur L. Carter Journalism Institute, New York University, New York, USA. Fall
- 2010 SLAC Summer Institute: Neutrinos - Nature's Mysterious Messengers,
SLAC National Accelerator Laboratory, Menlo Park, California, USA. August 2-13

FELLOWSHIPS AND AWARDS

- 2019 Postdoctoral Prize For Excellence
University of Maryland Department of Astronomy, May 2019
- 2017 Joint Space-Science Institute Prize Fellowship
University of Maryland and NASA Goddard Space Flight Center, Fall 2017 - Summer 2020

- 2015 Dean's Dissertation Fellowship
New York University, Fall 2015 - Summer 2016
- 2015 Dean's Outstanding Graduate Student Teaching Award, New York University
- 2014 James Arthur Fellowship
New York University, Fall 2014 - Summer 2015
- 2013 James Arthur Fellowship
New York University, Fall 2013 - Summer 2014
- 2011 Henry M. MacCracken Fellowship
New York University, Fall 2011 - Fall 2015
- 2011 Graduate Student Teaching Award, University of Alberta
- 2011 Graduate Student Scholarship, Government of Alberta

OUTREACH AND SERVICE

University of Maryland

- 2021 GRAD-MAP Summer Scholars Mentor
- 2021 GRAD-MAP Winter Workshop Mentor
- 2020 GRAD-MAP Winter Workshop Mentor
- 2019 GRAD-MAP Open House & Site Visit Speaker
- 2019-2021 Better Astronomy for the Next Generation (BANG) Seminar Organizing Committee
- 2017-2020 Department of Astronomy Equity, Diversity, and Inclusion Committee

NASA Goddard Space Flight Center

- 2019-2021 Ask An Astrophysicist contributor