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 Post Doctoral Associate, Astroparticle Physics Lab
University of Maryland College Park & NASA Goddard Space Flight Center

2021- Post Doctoral Researcher
Perimeter Institute for Theoretical Physics

Publications

Journal Articles

2022 Troja, E., Fryer, C. L., O'Connor, B., **Ryan, G.**, Dichiara, 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., Kutyrev, 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 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 submitted, 2022, [arXiv:astro-ph/2212.01104]

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 Dichiara, 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., Rebolo, 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., Dichiara, 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 Dichiara, 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., Dichiara, S., Chase, E., **Ryan, G.**, Cenko, S., Fryer, C., Ricci, R., Marshall, F., Kouveliotou, C., Wollaeger, R., Fontes, C., Korobkin, O., Gatkine, P., Kutyrev, A., Veilleux, S., Kawai, N., and Sakomoto, T. "A Tale Of Two Mergers: Contraints 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., Horesh, 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

Observing Proposals

2020 VLA Semester 20B "The collimation and energetics of short gamma-ray bursts"
PI Troja, 6 hrs

2020 VLA Semester 20B "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

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 "Minidiscs 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 Astrophsyics
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

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

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 contributer