

Matt Nicholl

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Interests

Supernova physics, superluminous supernovae, gravitational wave follow-up, tidal disruption events, fast radio bursts, transient surveys, optical and near-infrared observations, spectral analysis, light curve modelling, host galaxies of astrophysical transients

Appointments

2018– Royal Astronomical Society Research Fellow
 University of Edinburgh

2015–2018 Postdoctoral Research Fellow
 Harvard-Smithsonian Center for Astrophysics
 PI: Edo Berger

Education

2012–2015 PhD, Astrophysics
 Queen's University Belfast
 Thesis Title: Observations and modelling of superluminous supernovae
 Supervisor: Stephen Smartt

2008–2012 MPhys (First Class), Physics
 Oxford University

Research highlights

- Led superluminous supernova (SLSN) follow-up in major teams (Pan-STARRS, PESSTO), including first-author Nature paper in first year of PhD studies
- Thesis included the first statistical study of SLSNe, which has informed subsequent analyses by many other groups
- Discovered the first cleanly resolved double-peaked light curve of a SLSN. This is now a major topic of interest in multiple surveys
- Led papers on 4 of the 6 lowest-redshift SLSNe ever discovered, including the most extensive set of observations for any SLSN (SN 2015bn)
- Calculated for the first time the volumetric rate of Fast Radio Bursts and showed how their host galaxy properties may connect them to other transients
- Collaborated with a close team to develop the Modular Open Source Fitter for Transients ([MOSFiT](#))—a new publicly-available theoretical and statistical tool for modelling any astrophysical light curve. I led the first MOSFiT paper: the largest-ever parameter space exploration for SLSNe
- Led spectroscopic study of GW170817: an elusive ‘kilonova’ and the first source ever detected in both gravitational waves and light
- Collected and analyzed the latest-ever observations of a superluminous supernova relative to explosion using the Hubble Space Telescope

Selected Awards and Grants

2018	Royal Astronomical Society Research Fellowship · 3 years salary and research budget · Only 2 Fellowships awarded per year
2017	Hubble Space Telescope General Observer grants (2), Cycle 25
2016	Hubble Space Telescope General Observer grant, Cycle 24
2016	Michael Penston Prize of the Royal Astronomical Society · “Best UK thesis in astronomy or astrophysics”
2014	SET for Britain finalist · Presented my work at the Houses of Parliament
2009–2012	Lady Margaret Hall Scholarship · Awarded yearly for academic excellence
2008	Institute of Physics in Ireland GCE A-level Medal · For the highest A-level examination score in Physics
2008	Hans Sloan Award · For the highest combined A-level score in Physics, Chemistry and Biology in Northern Ireland
2008	Irish Physics Olympiad Gold Medal

Invited talks and major conferences

I am a regular speaker at conferences, here I list only some highlights:

Apr 2018	EWASS Symposium on GRB-SN connection (invited), Liverpool
Mar 2018	University of Rochester colloquium
Oct 2017	Oscar Klein Centre colloquium, Stockholm University
May 2017	Max Planck Institute for Extraterrestrial Physics
Apr 2017	Harvard-Smithsonian CfA colloquium
Feb 2017	Royal Astronomical Society ordinary meeting
Aug 2016	Supernova 2016 conference, Easter Island
Dec 2014	Las Cumbres Observatory Global Telescope colloquium
Dec 2013	Royal Astronomical Society ordinary meeting

Observing experience

Magellan	Optical imaging and spectroscopy using LDSS3c and IMACs · NIR imaging using FourStar and spectroscopy using FIRE · High-resolution spectroscopy using MagE
MMT	Remote observing, optical spectroscopy with Blue Channel
NTT	Optical and NIR imaging and spectroscopy using EFOSC2 and SOFI
WHT	Optical spectroscopy with ISIS
VLT	Target of Opportunity triggers and data reduction for X-Shooter and FORS2
HST	Phase II and data reduction experience with ACS, WFC3 and STIS

Scientific responsibilities held

2018–2019	Principal Investigator on SOAR program for spectroscopic follow-up of gravitational wave sources (6 triggers)
2017–2018	Principal Investigator on HST (4 orbits) and Gemini (2 hours) programs
2017	Hubble Space Telescope proposal review panel
2016–2017	PI on successful programs with Chandra (10ks), Gemini (6 hours), HST (3 orbits) and VLA (4 hours)
2016–	Regular reviewer for Gemini fast-turnaround proposals
2014–	Referee for ApJ, MNRAS and Nature Astronomy
2013–2015	Managed target of opportunity triggers for VLT program in PESSTO

Teaching

- 2017–2018 CfA [Student Mentoring Program](#) at a local high school. I supervised two students for a year-long project
- 2016–2017 Supervised a research project on Type II supernovae for Harvard undergraduate student Spencer Scott. This has resulted in a paper in press, led by Spencer
- 2012–2015 Computer lab demonstrator, Queen’s University Belfast
- 2014 Supervised work-placement projects for high school students at QUB

Public outreach and media

- Contributed to public excitement and understanding of the first joint electromagnetic–gravitational wave source through launch of a new website [kilonova.org](#), social media, and [press interviews](#)
- Paper on a very nearby superluminous supernova received significant [media attention](#), the highlight being a [radio interview](#) with the Canadian Broadcasting Corporation for their weekly science show (broadcast 2017-08-12)
- Always willing to provide comment to the media on new discoveries in astrophysics (e.g. [this recent piece](#))
- Receipt of the Michael Penston prize from the RAS in 2016 gave me the chance to talk to [local media](#) about my research
- Qualified as a STEM (Science, Technology, Engineering and Maths) Ambassador, for encouraging children to pursue scientific careers. In this capacity I have helped at several events, including:
 - BBC Stargazing Live events in Jan 2012 (Oxford), 2013, 2014 and 2015 (QUB). Involved helping visitors to use telescopes and talking to them about my own research
 - STFC “Seeing The Universe In All Its Light” Exhibition, May 2014. Taught local children about imaging systems in ground- and space-based astronomy
- Press release for Nature paper led to interviews with journalists for [international](#) and [local](#) news
- Interviewed about my work live on BBC Radio Foyle, Oct 2013

Languages

- English · Mother tongue
- Spanish · Intermediate (Queen’s University Language Centre)
- German · Basic (GCSE)

Personal references

- Prof. Edo Berger · Harvard University · Postdoc Advisor

- Prof. Stephen Smartt · Queen's University Belfast · PhD supervisor
- Prof. Brian Metzger · Columbia University · Collaborator
- Prof. Avishay Gal-Yam · Weizmann Institute of Science · Collaborator
- Prof. Philipp Podsiadlowski · Oxford University · MPhys supervisor
- Prof. Stefano Benetti · Osservatorio Astronomico di Padova · Collaborator

Publications

Summary:

- Total / **as first author**: 64 / **14**
- Citations: 3605 / **755**
- h-index: 34 / **12**

Full listing (titles link to abstracts on [ADS](#)):

First author

- [1] [Nebular-phase spectra of superluminous supernovae: physical insights from observational and statistical properties](#)
Nicholl, M., Berger, E., Blanchard, P. K., *et al.*, 2018, The Astrophysical Journal, accepted
- [2] [One Thousand Days of SN2015bn: HST Imaging Shows a Light Curve Flattening Consistent with Magnetar Predictions](#)
Nicholl, M., Blanchard, P. K., Berger, E., *et al.*, 2018, The Astrophysical Journal Letters, 866, L24
- [3] [The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. III. Optical and UV Spectra of a Blue Kilonova From Fast Polar Ejecta](#)
Nicholl, M., Berger, E., Kasen, D. *et al.*, 2017, The Astrophysical Journal Letters, 848, L18
- [4] [The magnetar model for Type I superluminous supernovae I: Bayesian analysis of the full multi-colour light curve sample with MOSFiT](#)
Nicholl, M., Guillochon, J., Berger, E., 2017, The Astrophysical Journal, 850, 55
- [5] [The Superluminous Supernova SN 2017egm in the Nearby Galaxy NGC 3191: A Metal-rich Environment Can Support a Typical SLSN Evolution](#)
Nicholl, M., Berger, E., Margutti, R., *et al.*, 2017, The Astrophysical Journal Letters, 845, L8
- [6] [Empirical constraints on the origin of fast radio bursts: volumetric rates and host galaxy demographics as a test of millisecond magnetar connection](#)
Nicholl, M., Williams, P. K. G., Berger, E., *et al.*, 2017, The Astrophysical Journal, 843, 84
- [7] [An Ultraviolet Excess in the Superluminous Supernova Gaia16apd Reveals a Powerful Central Engine](#)
Nicholl, M., Berger, E., Margutti, R., *et al.*, 2017, The Astrophysical Journal Letters, 835, L8
- [8] [Superluminous supernova 2015bn in the nebular phase: evidence for the engine-powered explosion of a stripped massive star](#)
Nicholl, M., Berger, E., Margutti, R., *et al.*, 2016, The Astrophysical Journal Letters, 828, L18
- [9] [SN 2015BN: A Detailed Multi-wavelength View of a Nearby Superluminous Supernova](#)
Nicholl, M., Berger, E., Smartt, S. J., *et al.*, 2016, The Astrophysical Journal, 826, 39
- [10] [Seeing double: the frequency and detectability of double-peaked superluminous supernova light curves](#)
Nicholl, M. & Smartt, S. J., 2016, Monthly Notices of the Royal Astronomical Society Letters, 457, 79

- [11] [On the diversity of superluminous supernovae: ejected mass as the dominant factor](#)
Nicholl, M., Smartt, S. J., Jerkstrand, A., *et al.*, 2015, Monthly Notices of the Royal Astronomical Society, 452, 3869
- [12] [LSQ14bdq: A Type Ic Super-luminous Supernova with a Double-peaked Light Curve](#)
Nicholl, M., Smartt, S. J., Jerkstrand, A., *et al.*, 2015, The Astrophysical Journal Letters, 807, 18
- [13] [Superluminous supernovae from PESSTO](#)
Nicholl, M., Smartt, S. J., Jerkstrand, A., *et al.*, 2014, Monthly Notices of the Royal Astronomical Society, 444, 2096
- [14] [Slowly fading super-luminous supernovae that are not pair-instability explosions](#)
Nicholl, M., Smartt, S. J., Jerkstrand, A., *et al.*, 2013, Nature, 502, 346

Second author

- [15] [A Hydrogen-Poor Superluminous Supernova with Enhanced Iron-Group Absorption: A New Link Between SLSNe and Broad-Lined Type Ic SNe](#)
 Blanchard, P. K., **Nicholl, M.**, Berger, E., *et al.*, 2018, The Astrophysical Journal, submitted
- [16] [Superluminous Supernovae in LSST: Rates, Detection Metrics, and Light Curve Modeling](#)
 Villar, V. A., **Nicholl, M.**, Berger, E., *et al.*, 2018, The Astrophysical Journal, accepted
- [17] [MOSFiT: Modular Open-Source Fitter for Transients](#)
 Guillochon, J., **Nicholl, M.**, Villar, V. A., *et al.*, 2018, The Astrophysical Journal Supplement Series, 236, 6
- [18] [Systematic Investigation of the Fallback Accretion-powered Model for Hydrogen-poor Superluminous Supernovae](#)
 Moriya, T., **Nicholl, M.**, Guillochon, J., *et al.*, 2018, The Astrophysical Journal, 867, 113
- [19] [The Type I Superluminous Supernova PS16aqv: Lightcurve Complexity and Deep Limits on Radioactive Ejecta in a Fast Event](#)
 Blanchard, P. K., **Nicholl, M.**, Berger, E., *et al.*, 2018, The Astrophysical Journal, 865, 9
- [20] [PS16dtm: A Tidal Disruption Event in a Narrow-line Seyfert 1 Galaxy](#)
 Blanchard, P. K., **Nicholl, M.**, Berger, E., *et al.*, 2017, The Astrophysical Journal, 843, 106
- [21] [Complexity in the light curves and spectra of slow-evolving superluminous supernovae](#)
 Inserra, C., **Nicholl, M.**, Chen, T.-W., *et al.*, 2017, Monthly Notices of the Royal Astronomical Society, 468, 4642
- [22] [The evolution of superluminous supernova LSQ14mo and its interacting host galaxy system](#)
 Chen, T.-W., **Nicholl, M.**, Smartt, S. J., *et al.*, 2017, Astronomy & Astrophysics, 602, A9
- [23] [The supernova CSS121015:004244+132827: a clue for understanding super-luminous supernovae](#)
 Benetti, S., **Nicholl, M.**, Cappellaro, E., *et al.*, 2014, Monthly Notices of the Royal Astronomical Society, 441, 289

Other

- [24] [A Search for Optical Emission from Binary-Black-Hole Merger GW170814 with the Dark Energy Camera](#)

- Doctor, Z., Kessler, R., Herner, K., *et al.*, 2018, *The Astrophysical Journal*, submitted
- [25] [Where is the Engine Hiding Its Missing Energy? Constraints from a Deep X-Ray Non-detection of the Superluminous SN 2015bn](#)
Bhrombhakdi, K., Chornock, R., Margutti, R., **Nicholl, M.** *et al.*, 2018, *The Astrophysical Journal Letters*, 868, 32
- [26] [An embedded X-ray source shines through the aspherical AT2018cow: revealing the inner workings of the most luminous fast-evolving optical transients](#)
Margutti, R., Metzger, B. D., Chornock, R., *et al.*, 2018, *The Astrophysical Journal*, submitted
- [27] [Unveiling the engines of fast radio bursts, superluminous supernovae, and gamma-ray bursts](#)
Margalit, B., Metzger, B. D., Berger, E., **Nicholl, M.**, *et al.*, 2018, *Monthly Notices of the Royal Astronomical Society*, 481, 2407
- [28] [Serendipitous Discovery of a 14 year old Supernova at 16 Mpc](#)
Guillochon, J., Stockler de Moraes, J., **Nicholl, M.**, *et al.*, 2018, *Research Notes of the American Astronomical Society*, 2, 165
- [29] [Spitzer Space Telescope Infrared Observations of the Binary Neutron Star Merger GW170817](#)
Villar, V. A., Cowperthwaite, P. S., Berger, E., *et al.*, 2018, *The Astrophysical Journal Letters*, 826, 11
- [30] [A Decline in the X-ray through Radio Emission from GW170817 Continues to Support an Off-Axis Structured Jet](#)
Alexander, K. D., Margutti, R., Blanchard, P. K., *et al.*, 2018, *The Astrophysical Journal Letters*, 863, 18
- [31] [Jets in Hydrogen-poor Super-luminous Supernovae: Constraints from a Comprehensive Analysis of Radio Observations](#)
Coppejans, D. L., Margutti, R., Guidorzi, C., *et al.*, 2018, *The Astrophysical Journal*, 856, 56
- [32] [The Binary Neutron Star event LIGO/VIRGO GW170817 160 days after merger: synchrotron emission across the electromagnetic spectrum](#)
Margutti, R., Alexander, K. D., Xie, X., *et al.*, 2018, *The Astrophysical Journal Letters*, 856, 18
- [33] [A Precise Distance to the Host Galaxy of the Binary Neutron Star Merger GW170817 Using Surface Brightness Fluctuations](#)
Cantiello, M., Jensen, J. B., Blakeslee, J. P., *et al.*, 2018, *The Astrophysical Journal Letters*, 854, L31
- [34] [How Many Kilonovae Can Be Found in Past, Present, and Future Survey Datasets?](#)
Scolnic, D., Kessler, R., Brout, D., *et al.*, 2018, *The Astrophysical Journal Letters*, 852, L2
- [35] [Results from a systematic survey of X-ray emission from Hydrogen-poor Superluminous Supernovae](#)
Margutti, R., Chornock, R., Metzger, B. D., *et al.*, 2018, *The Astrophysical Journal*, 864, 45
- [36] [Superluminous supernova progenitors have a half-solar metallicity threshold](#)
Chen, T.-W., Smartt, S. J., Yates, R. M., **Nicholl, M.**, *et al.*, 2017, *Monthly Notices of the Royal Astronomical Society*, 470, 3566
- [37] [Long-duration superluminous supernovae at late times](#)
Jerkstrand, A., Smartt, S. J., Inserra, C., **Nicholl, M.**, *et al.*, 2017, *The Astrophysical Journal*, 835,

- [38] [The GRB-SLSN Connection: mis-aligned magnetars, weak jet emergence, and observational signatures](#)
Margalit, B., Metzger, B. D., Thompson, T. A., **Nicholl, M.**, Sukhbold, T., 2018, *Monthly Notices of the Royal Astronomical Society*, 475, 2659
- [39] [The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/Virgo GW170817. I. Dark Energy Camera Discovery of the Optical Counterpart](#)
Soares-Santos, M., Holz, D. E., Annis, J., *et al.*, 2017, *The Astrophysical Journal Letters*, 848, L16
- [40] [The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. II. UV, Optical, and Near-IR Light Curves and Comparison to Kilonova Models](#)
Cowperthwaite, P. S., Berger, E., Villar, V. A., Metzger, B. D., **Nicholl, M.**, *et al.*, 2017, *The Astrophysical Journal Letters*, 848, L17
- [41] [The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. IV. Detection of Near-infrared Signatures of r-process Nucleosynthesis with Gemini-South](#)
Chornock, R., Berger, E., Kasen, D., Cowperthwaite, P. S., **Nicholl, M.**, *et al.*, 2017, *The Astrophysical Journal Letters*, 848, L19
- [42] [The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. V. Rising X-ray Emission from an Off-Axis Jet](#)
Margutti, R., Berger, E., Fong, W., *et al.*, 2017, *The Astrophysical Journal Letters*, 848, L20
- [43] [The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. VI. Radio Constraints on a Relativistic Jet and Predictions for Late-Time Emission from the Kilonova Ejecta](#)
Alexander, K. D., Berger, E., Fong, W., *et al.*, 2017, *The Astrophysical Journal Letters*, 848, L21
- [44] [The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. VII. Properties of the Host Galaxy and Constraints on the Merger Timescale](#)
Blanchard, P. K., Berger, E., Fong, W., **Nicholl, M.**, *et al.*, 2017, *The Astrophysical Journal Letters*, 848, L22
- [45] [The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. VIII. A Comparison to Cosmological Short-duration Gamma-ray Bursts](#)
Fong, W., Berger, E., Blanchard, P. K., *et al.*, 2017, *The Astrophysical Journal Letters*, 848, L23
- [46] [The Complete Ultraviolet, Optical, and Near-Infrared Light Curves of the Kilonova Associated with the Binary Neutron Star Merger GW170817: Homogenized Data Set, Analytic Models, and Physical Implications](#)
Villar, V. A., Guillochon, J., Berger, E., *et al.*, 2017, *The Astrophysical Journal Letters*, 851, L21
- [47] [Improved Constraints on H0 from a combined analysis of gravitational-wave and electromagnetic emission from GW170817](#)
Guidorzi, C., Margutti, R., Brout, D., *et al.*, 2017, *The Astrophysical Journal Letters*, 851, L36
- [48] [Multi-messenger Observations of a Binary Neutron Star Merger](#)
Abbott, B. P., Abbott, R., Abbott, T. D., *et al.*, 2017, *The Astrophysical Journal Letters*, 848, L12
- [49] [A gravitational-wave standard siren measurement of the Hubble constant](#)
Abbott, B. P., Abbott, R., Abbott, T. D., *et al.*, 2017, *Nature*, 551, 85

- [50] [Hydrogen-rich supernovae beyond the neutrino-driven core-collapse paradigm](#)
Terreran, G., Pumo, M. L., Chen, T.-W., *et al.*, 2017, *Nature Astronomy*, 1, 713
- [51] [X-rays from the location of the double-humped transient ASASSN-15lh](#)
Margutti, R., Metzger, B. D., Chornock, R., *et al.*, 2017, *The Astrophysical Journal*, 836, 25
- [52] [The Superluminous Transient ASASSN-15lh as a Tidal Disruption Event from a Kerr Black Hole](#)
Leloudas, G., Fraser, M., Stone, N. C., *et al.*, 2016, *Nature Astronomy*, 1, 2
- [53] [On the nature of Hydrogen-rich Superluminous Supernovae](#)
Inserra, C., Smartt, S. J., Gall, E. E. E., *et al.*, 2018, *Monthly Notices of the Royal Astronomical Society*, 475, 1046
- [54] [Localization and Broadband Follow-up of the Gravitational-wave Transient GW150914](#)
Abbott, B. P., Abbott, R., Abbott, T. D., *et al.*, 2016, *The Astrophysical Journal*, 826, 13
- [55] [Supplement: Localization and Broadband Follow-up of the Gravitational-wave Transient GW150914](#)
Abbott, B. P., Abbott, R., Abbott, T. D., *et al.*, 2016, *The Astrophysical Journal Supplement Series*, 225, 8
- [56] [Pan-STARRS and PESSTO search for an optical counterpart to the LIGO gravitational wave source GW150914](#)
Smartt, S. J., Chambers, K. C., Smith, K. W., *et al.*, 2016, *Monthly Notices of the Royal Astronomical Society*, 462, 4094
- [57] [SN 2012aa - a transient between Type Ibc core-collapse and superluminous supernovae](#)
Roy, R., Sollerman, J., Silverman, J. M., *et al.*, 2016, *Astronomy & Astrophysics*, 596, 67
- [58] [LSQ13fn: A type II-Plateau supernova with a possibly low metallicity progenitor that breaks the standardised candle relation](#)
Polshaw, J., Kotak, R., Dessart, L., *et al.*, 2016, *Astronomy & Astrophysics*, 588, 1
- [59] [Explosion of a massive, He-rich star at \$z = 0.16\$](#)
Elias-Rosa, N., Pastorello, A., **Nicholl, M.**, *et al.*, 2015, *Monthly Notices of the Royal Astronomical Society*, 451, 3151
- [60] [The host galaxy and late time evolution of the super-luminous supernova PTF12dam](#)
Chen, T.-W., Smartt, S. J., Jerkstrand, A., **Nicholl, M.**, *et al.*, 2015, *Monthly Notices of the Royal Astronomical Society*, 452, 1567
- [61] [OGLE-2013-SN-079: a lonely supernova consistent with a helium shell detonation](#)
Inserra, C., Sim, S. A., Wyrzykowski, L., *et al.*, 2015, *The Astrophysical Journal Letters*, 799, 2
- [62] [PESSTO: survey description and products from the first data release of the Public ESO Spectroscopic Survey of Transient Objects](#)
Smartt, S. J., Valenti, S., Fraser, M., *et al.*, 2015, *Astronomy and Astrophysics*, 579, 40
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McCrum, M., Smartt, S. J., Kotak, R., *et al.*, 2014, *Monthly Notices of the Royal Astronomical Society*, 437, 656
- [64] [Super-luminous Type Ic Supernovae: Catching a Magnetar by the Tail](#)
Inserra, C., Smartt, S. J., Jerkstrand, A., *et al.*, 2013, *The Astrophysical Journal*, 770, 128