

REBECCA E. A. CANNING - CV

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EDUCATION AND TRAINING Institute of Astronomy, University of Cambridge, Ph.D. 2012 (Astronomy)
University of Cambridge, M.Sci., M.A. 2008 (Physics, Natural Sciences)

ACADEMIC APPOINTMENTS Research Scientist, Stanford University (2018–current)
Einstein Fellow KIPAC (2015 to 2018)
Postdoctoral scholar KIPAC and Stanford University (2012 to 2015)

Awards

- 2018 MIT Rising Star in Physics (1 of 25 women selected in all Physical Sciences)
- 2017 NVIDIA GPU Research Award
- 2015 NASA Einstein Prize Postdoctoral Fellowship

Research Grants

SUCCESSFUL GRANTS AS PI OR AS THE MAJORITY CONTRIBUTOR

- NVIDIA GPU Grant, 2017, PI Canning, Equipment funding for Titan Xp GPU
 - *Chandra* observing proposal grant, 2017, PI Canning, \$87,054
 - *HST* observing proposal grant, 2017, PI Gladders, Chicago \$430,000 (1/3 authored by Canning \$140,000 research funds awarded to Stanford University)
 - *HST* observing proposal grant, 2017, PI Canning, \$79,997
 - Astrophysics Data Analysis Program, 2015, PI Allen¹(authored by Canning), \$334,241
- ¹Due to Stanford restriction on postdoctoral PIs
- Einstein Fellowship, Sept 2015 - Aug 2018
 - *Chandra* archival research grant, 2014, PI Canning, \$59,947
 - HST observing proposal grant, 2013, PI Canning, \$38,798
 - *Chandra* observing proposal grant, 2012, PI Canning, \$76,375
 - The Royal Astronomical Society, UK, Research Travel Grant, 2012, £600
 - Cambridge Philosophical Society, Research Studentship Grant, 2012, £2,200
 - Cambridge Philosophical Society, Research Travel Grant, 2012, £500
 - Selwyn College Cambridge, travel grant, 2012, 2011, 2010, various total ~£1,000

Observing

SUCCESSFUL TELESCOPE PROPOSALS AS PI

- Chandra, 2017, “Witnessing the formation of a radio halo”
- HST, 2017, “HST Grism observations of the highest-z massive galaxy cluster”
- Gemini, 2017, “The role of environment in triggering/quenching X-ray AGN”
- ALMA, 2016, “Fine tuning AGN feedback”
- VLT, VIMOS, 2016B, “The first maps of million K gas using ground based spectra”
- Chandra, archival proposal, Cycle 16, 2014, “Establishing the origin of hot gas in early-type galaxies”
- SINFONI, Very Large Telescope, 2013b, “Feeding and Feedback in Abell 3581”
- Hubble Space Telescope, 4 orbits, Cycle 21, “Riding the wake of a cluster merger: star formation, filaments and turbulence”
- *Chandra*, 150 ks, Cycle 14, “Probing galaxy formation with fast rotating elliptical galaxies”
- ISIS, William Herschel Telescope, 2012b, “Gas pressure and the initial mass function”
- GMOS, Gemini, 2012a, 2011a, “The dynamics of the merging galaxy cluster Abell 2146”
- ISIS, William Herschel Telescope, 2011b, “ISIS observations of NGC 1275”
- FORS2, Very Large Telescope, 2011b, “Detecting the hot ICM in brightest group and cluster galaxies using optical coronal emission lines”
- OASIS, William Herschel Telescope, 2011a, 2010a, “Riding the wake of a merging galaxy cluster”
- AF2/WYFFOS, William Herschel Telescope, 2010a, “The dynamics of the merging galaxy cluster Abell 2146”

OBSERVING EXPERIENCE

- Gemini South, GMOS, MOS observations, 2017, (mentoring graduate student)
- Very Large Telescope, VIMOS, IFU observations, 2016, (mentoring graduate student)
- William Herschel Telescope, LIRIS, IR imaging, 2011
- William Herschel Telescope, ISIS, imaging polarimetry, 2010
- Very Large Telescope, VIMOS, IFU observations, 2009
- William Herschel Telescope, ISIS, long-slit spectroscopy, 2009

Community Service

POSITIONS HELD

Kavli Institute for Particle Astrophysics, Colloquium committee, 2016-current
Kavli Institute for Particle Astrophysics, Graduate Admissions Committee, 2016-2017
Kavli Institute for Particle Astrophysics, Postdoc representative, 2013-2014
Kavli Institute for Particle Astrophysics, Education and Outreach Committee, 2013-current
Institute of Astronomy, Cambridge, Graduate Student Mentor, 2009-2010

OTHER SERVICE

Referee for MNRAS, AJ, ApJ
NESSF proposal referee 2018
CFHT proposal referee 2017, 2018
NOAO LCO TAC participant 2017

Chandra TAC participant 2016
HST TAC participant 2015
Co-founded or organized numerous departmental group meetings and seminars

Teaching

RESEARCH MENTOR

Primary mentoring role: (Emil Norrdeh, now 4th year Ph.D. thesis on AGN populations in galaxy clusters; Stanislav Fort, now 3rd year Ph.D. thesis on machine learning application in X-ray images; Lark Wang, current undergraduate student on using neural networks to detect and classify AGN in radio images)

Co-mentoring role: (Anna Ogorzalek, now 5th year Ph.D., specifically optical observations and paper on coronal line emission in a nearby galaxy; Ben Floyd now 2nd year Ph.D., specifically IR AGN in galaxy clusters).

UNDERGRADUATE/GRADUATE TAUGHT COURSES

2017 Guest lecture for Prof. R Blandford in Physics 361 at Stanford University

2016 Guest lecture for Prof. S Allen in Physics 100 at Stanford University

2015 Guest lecture for Prof. S Allen in Physics 100 at Stanford University

2008-2012 Supervisor for Part Ia Physics (first year undergraduate degree level) in the Natural Sciences Tripos at the University of Cambridge

Involved tutoring students in Mechanics, Dynamics and Special Relativity, Oscillations, Waves and Optics, Quantum Waves, Gravitational and Electromagnetic Fields and Experimental Physics, ~3 hours per week for the entire academic year.

2010-2011 University of Cambridge Mathematics Ia Tripos (*first year undergraduate degree level*)
Exam double marking

Outreach

March 24th 2013 to 2018 KIPAC 10th to 15th Anniversary public open day

May 28th 2013 Oak Willow School in East Menlo Park “How do we classify galaxies”

May 23rd 2013 Costano School in East Palo Alto “How do we classify galaxies”

2010 - 2011 Talk to ‘Headstart’ summer students, “Studying physics at University”

2010 - 2011 Stall at career conventions for local Cambridgeshire schools

2010 “Opportunities after physics degrees” to 2nd/3rd year Netherlands undergraduates

2008 - 2012 Taught for Astronomy badges to local guide, scout, cub and brownie groups

2008 - 2012 Provided front of house support at IoA, Cambridge Wednesday open evenings. ‘*Front of house*’ involves operating telescopes and leading star gazing with public, giving telescope tours and organising/preparing lecture theatre for lectures

2008 - 2012 Assisted with organising and running of IoA, Cambridge departmental annual open days

Research Presentations

ORGANIZATIONAL

- Organizer and workshop chair, 11/2018, “Machine Learning in Astrophysics: a micro-workshop” (Keynote by Prof. D. Finkbeiner)
- Spotlight talk organizer, DESI collaboration meeting, Stanford, 2017

INVITED

- Durham conference, invited panel member, “Are AGN Special?”, 07/2018
- Sesto invited workshop on “Multiphase AGN Feeding Feedback”, 07/2018
- MIT Rising Stars in Physics, invited workshop, 04/2018
- Lorentz center invited workshop on “Quenching galaxies at high redshift”, Leiden 11/2017
- Chicago “fellows at the frontiers” invited conference, 09/2016

CONTRIBUTED

- IAU special session, 08/2018, “High redshift galaxy clusters”
- Snowcluster, Utah, 03/2018
- Early stages of Galaxy Cluster Formation (ESO GCF 2017), Munich, 07/2017, “AGN in massive galaxy clusters: Cluster AGN Topography Survey (CATS)”
- Galaxy Clusters 2017, Santander, 07/2017, “AGN evolution in massive galaxy clusters from $z=0$ to $z=1.7$ ”
- Galaxy clusters: physics laboratories and cosmological probes, Cambridge, 12/2016, “The role of large-scale structure in the triggering/quenching of AGN”
- Chandra next decade conference, Boston, 08/2016
- Aspen workshop on black holes, 06/2016
- X-ray Vision Workshop, 6-8/10/2015, “X-ray AGN in the Cluster Environment”
- Evolving galaxies in an evolving environment, Bologna, 15-19/09/2014, “X-ray AGN in massive galaxy clusters ”
- Quenching and Quiescence, invited talk, Heidelberg, 14-18/07/2014, “Radio Mode AGN Observations”
- X-ray View of Galaxy Ecosystems Chandra Workshop Presentations, Boston, 09-11/07/2014, “The origin of cold gas in giant ellipticals and its role in fueling AGN feedback” and “On the triggering of X-ray AGN in clusters”

COLLABORATION MEETINGS

- SPT cluster workshop, Chicago 06/2018, FermiLab 03/2017, Chicago 06/2016
- DESI collaboration meeting, SLAC 2017, LBNL 06/2017, SLAC 2016

DEPARTMENTAL SEMINARS

- Departmental seminar, Imperial, 10/2018
- Departmental seminar, LBNL, Berkley, 04/2018
- Departmental seminar Durham University, 02/2018
- Departmental seminar Nottingham University, 02/2018
- Departmental seminar Institute of Astronomy, 01/2018
- Departmental seminar, Bristol, 11/2017, “Spinning webs and beating hearts: large scale structure and the evolution of super-massive black holes”

- Colloquium, UAH, 10/2016
- Departmental seminar, Maryland, 04/2016
- X-ray group, IoA *X-ray AGN in massive galaxy clusters*, 05/09/2014
- Kavli Institute for Particle Astrophysics *Making the case for particle excitation of filaments in Brightest Cluster Galaxies*, 29/01/2013
- Kavli Institute for Particle Astrophysics , 05/10/2012
- *219th AAS*, Dissertation talk, 8-12/01/2012
- X-ray group, IoA *Emission line nebulae in NGC 4696*, 08/04/2011
- X-ray group, IoA *Riding the wake of a merging galaxy cluster*, 05/11/2010
- Institute of Astronomy *First detection of optical coronal emission from intermediate temperature gas in NGC 4696*, 20/09/2010
- Nottingham University *Intermediate temperature gas in Brightest Cluster Galaxies* 05/09/2010
- X-ray group, IoA *Coronal lines as probes of intermediate temperature gas in NGC 4696*, 23/04/2010
- X-ray group, IoA *Integral field spectroscopy of optical line emission in BCGs*, 27/11/2009
- X-ray group, IoA *Star formation in NGC 1275*, 31/07/2009
- Student seminar, IoA *Star formation in NGC 1275*, 14/01/2009

CONFERENCE POSTERS

- *XXIII Canary Islands Winter School: Secular evolution of Galaxies*, poster, 14-25/11/2011
- *Monsters, Inc.: Astrophysics and Cosmology with Galaxy Clusters*, poster, 14-18/03/2011
- *Non-thermal phenomena in colliding galaxy clusters*, poster, 15-18/11/2010
- *Snowcluster*, poster, 28/03-02/04/2010
- *JENAM*, 20-23/04/2009

Refereed Publications

- Bocquet (12 coauthors); **Canning, R.E.A** et al., 2018, in press, arXiv, *Cluster Cosmology Constraints from the 2500 deg² SPT-SZ Survey: Inclusion of Weak Gravitational Lensing Data from Magellan and the Hubble Space Telescope*
- McDonald (7 coauthors); **Canning, R.E.A** et al., 2018, in press, arXiv, *A Detailed Study of the Most Relaxed SPT-Selected Galaxy Clusters: Cool Core and Central Galaxy Properties*
- Juranova (5 coauthors); **Canning, R.E.A** et al., 2018, in press, arXiv, *Cooling in the X-ray halo of the rotating, massive early-type galaxy NGC 7049*
- Strazzullo (13 coauthors); **Canning, R.E.A** et al., 2018, in press, arXiv, *Galaxy populations in the most distant SPT-SZ clusters - I. Environmental quenching in massive clusters at $1.4 < z < 1.7$*
- Khullar (11 coauthors); **Canning, R.E.A** et al., in press, 2018, arXiv, *Spectroscopic Confirmation of Five Galaxy Clusters at $z \lesssim 1.25$ in the 2500 sq. deg. SPT-SZ Survey*
- Lakhchaura (2 coauthors); **Canning, R.E.A** et al., 2018, MNRAS, 481, 4472, *Thermodynamic properties, multiphase gas and AGN feedback in a large sample of giant ellipticals*
- Werner, N.; Lakhchaura, K.; **Canning, R. E. A.** et al. 2018, MNRAS, 477, 3886, *Digging for red nuggets: discovery of hot haloes surrounding massive, compact, relic galaxies*
- Simionescu, A.; (2 coauthors); **Canning, R. E. A.**, et al. 2018, MNRAS, 475, 3004, *ALMA observation of the disruption of molecular gas in M87*
- Hitomi Collaboration, et al. 2018, PASJ, 70, 9, *Atmospheric gas dynamics in the Perseus cluster observed with Hitomi*

- Raimundo, S. I.; Davies, R. I.; **Canning, R. E. A.**, et al. 2017, MNRAS, 464, 4227, *Tracing the origin of the AGN fuelling reservoir in MCG-6-30-15*
- Ogorzalek, A., (5 coauthors) **Canning, R. E. A.** et al. 2017, MNRAS, 472, 1659, *Improved measurements of turbulence in the hot gaseous atmospheres of nearby giant elliptical galaxies*
- **Canning, R.E.A.**, et al., 2017, MNRAS, 464, 2896, *A series of shocks and edges in Abell 2219*
- Coleman, (3 coauthors) **Canning, R.E.A.**, et al. 2017, MNRAS, 464, 2469, *The mass distribution of the unusual merging cluster Abell 2146 from strong lensing*
- Raimundo, Davies, **Canning, R.E.A.**, et al. 2016, MNRAS, accepted, *Tracing the origin of the AGN fuelling reservoir in MCG-6-30-15*
- Pinto, (11 coauthors) **Canning, R.E.A.**, 2016, MNRAS, 461, 2077, *Insights into the location and dynamics of the coolest X-ray emitting gas in clusters of galaxies*
- Fabian, (3 coauthors), **Canning, R.E.A.**, et al. 2016, MNRAS, 461, 922, *HST imaging of the dusty filaments and nucleus swirl in NGC4696 at the centre of the Centaurus Cluster*
- Werner, Zhuravleva, **Canning, R.E.A.**, et al. 2016, MNRAS, 460, 2752, *Deep Chandra study of the truncated cool core of the Ophiuchus cluster*
- King, (6 coauthors), **Canning, R.E.A.**, et al. 2016, MNRAS, 459, 517, *The distribution of dark and luminous matter in the unique galaxy cluster merger Abell 2146*
- Sanders, (4 coauthors), **Canning, R.E.A.**, et al. 2016, MNRAS, 457, 82, *A very deep Chandra view of metals, sloshing and feedback in the Centaurus cluster of galaxies*
- **Canning, R.E.A.**, et al., 2016, MNRAS, 455, 3042, *Collisional excitation of [C II], [O I] and CO in massive galaxies*
- White, **Canning, R.E.A.**, et al., 2016, MNRAS, 453, 2718, *Dynamical analysis of galaxy cluster merger Abell 2146*
- Chatzikos, (2 coauthors) **Canning, R.E.A.**, et al. 2014, MNRAS, 446, 1234, *Implications of Coronal Line Emission in NGC 4696*
- Ichinohe, (3 coauthors) **Canning, R.E.A.**, et al., 2014, MNRAS, 448, 2971, *The growth of the galaxy cluster Abell 85: mergers, shocks, stripping and seeding of clumping*
- Ehlert, S. (2 coauthors) **Canning, R.E.A.**, et al., 2014, MNRAS, 446, 2709, *X-ray bright active galactic nuclei in massive galaxy clusters III: New insights into the triggering mechanisms of cluster AGN*
- **Canning, R.E.A.** et al., 2014, MNRAS, 444, 336 *Filamentary star formation in NGC 1275*
- Werner, (4 coauthors) **Canning, R.E.A.**, et al., 2013, MNRAS, 439, 2291, *The origin of cold gas in giant elliptical galaxies and its role in fueling radio-mode AGN feedback*
- **Canning, R.E.A.**, et al., 2013, MNRAS, 435, 1108 *A multiwavelength view of cooling versus AGN heating in the X-ray luminous cool-core of Abell 3581*
- Hlavacek-Larrondo, J. (3 coauthors) **Canning, R.E.A.**, et al., 2013, SpJ, 777, 163, *Probing the Extreme Realm of Active Galactic Nucleus Feedback in the Massive Galaxy Cluster, RX J1532.9+3021*
- Ishibashi, W.; Fabian, A. C.; **Canning, R.E.A.**, 2013, MNRAS, 431, 2350 *Can AGN feedback-driven star formation explain the size evolution of massive galaxies?*
- Raimundo, S. I., (3 coauthors) **Canning, R.E.A.**, et al., 2013, MNRAS, 431, 2294 *The black hole and central stellar population of MCG-6-30-15*

- Werner, N.; Oonk, J. B. R.; **Canning, R.E.A.**, et al., 2013, ApJ, 767, 153 *The Nature of Filamentary Cold Gas in the Core of the Virgo Cluster*
- **Canning, R.E.A.**, et al., 2012, MNRAS, 420, 2956 *Riding the wake of a merging galaxy cluster*
- Johnstone, R. M.; **Canning, R.E.A.**, et al., 2012, MNRAS, 425, 1421 *Hydrogen two-photon continuum emission from the Horseshoe filament in NGC 1275*
- Russell, H. R., (4 coauthors) **Canning, R.E.A.**, et al., 2012, MNRAS, 423, 236, *Shock fronts, electron-ion equilibration and intracluster medium transport processes in the merging cluster Abell 2146*
- **Canning, R.E.A.**, et al. 2011, MNRAS, 417, 3080, *A deep spectroscopic study of the filamentary nebulosity in NGC 4696, the brightest cluster galaxy in the Centaurus cluster*
- **Canning, R.E.A.**, et al., 2011, MNRAS, 411, 411, *Detection of optical coronal emission from 10^6 -K gas in the core of the Centaurus cluster*
- Mittal, R., (4 coauthors), **Canning, R.E.A.**, et al., 2011, MNRAS, 418, 2386 *Herschel observations of the Centaurus cluster - the dynamics of cold gas in a cool core*
- Fabian, A. C., (2 coauthors) **Canning, R.E.A.**, et al., 2011, 418, 2154, *A wide Chandra view of the core of the Perseus cluster*, MNRAS, 2011, 418, 2154
- Russell, H. R., (6 coauthors) **Canning, R.E.A.**, et al., 2011, 417, 1, *A merger mystery: no radio halo in the merging cluster Abell 2146*
- **Canning, R.E.A.**, et al., 2010, 405, 115 *Star formation in the outer filaments of NGC 1275*