Section c. Early Achievements Track-record (max. 2 pages)

My (*NPR*) research focuses on implementing novel algorithms and techniques in order to discover and study the physical processes in quasars. After spending 7 years in the United States (working at Penn State, Lawrence Berkeley National Lab and then as an Assistant Research Professor at Drexel University) I returned to the U.K. with the award of an STFC Ernest Rutherford Fellowship, one of the most senior personal astrophysics fellowships in the UK, which has an application oversubscription of ~20:1 and is over £500,000 (€630,000) on award.

I have established myself as an independent lead investigator and have led the discovery of new types of quasars: the **Extremely Red Quasars**, (*NPR* et al. 2015, MNRAS) and with my research team leading the discovery of the first sample of the new **Changing Look Quasars** (MacLeod, *NPR* et al. 2016, MNRAS). My team has also led the production of the largest areal space-based survey using NASA's *Spitzer Space Telescope* (Timlin, *NPR* et al. 2016, ApJS). This has led to the ground breaking and novel first measurement of infrared quasar clustering at high-redshift (Timlin, *NPR* et al. 2018, ApJ, accepted).

The PI led the team that was responsible for obtaining the data necessary for the SDSS-III BOSS cosmology experiment, leading to the first measurement of baryon acoustic oscillations at high-redshift. The PI's leadership includes leading science teams such as the **SDSS-III BOSS Quasar Science Working Group** which has resulted in an *extremely high publication output including 118 peer-review journal articles with 15,000 citations and an h-index of 59 (SAO/NASA Astrophysics Data System).* This is world-leading for any astrophysicist and virtually unparalleled by my contemporaries at a similar career stage.

I am an expert in a suite of research methodologies in **data science** and machine learning. In particular, at the heart of my research with the SDSS-BOSS project, was anomaly detection in extremely large datasets. I was a co-founder and Chief Data Scientist of, **String Security *Inc.*** There I built a predictive threat detection and remediation platform for cyber security teams by applying machine learning and predictive algorithms. The PI is currently in discussion with the School of Informatics at the UoE on potential joint projects and research avenues.

Relevant Selected Journal Publications *(N.B.* None with PhD supervisor, ***citations in red****)*

Pâris, Isabelle; Petitjean, Patrick; **Ross, Nicholas P.** et al "*The Sloan Digital Sky Survey Quasar Catalog: Twelfth data release",* 10.1051/0004-6361/201527999, **2017A&A...597A..79P** **(96)** Production of the current state-of-the-art quasar catalogue with associated metadata.

Hamann, Fred; Zakamska, Nadia L.; **Ross, Nicholas P.** et al. *"Extremely red quasars in BOSS"*, 10.1093/mnras/stw2387, **2017MNRAS.464.3431H**, **(13)** Follow-up analysis to the Ross et al. (2015) discovery paper.

Timlin, John D.; **Ross, Nicholas P.** et al. "*SpIES: The Spitzer IRAC Equatorial Survey",* 10.3847/0067-0049/225/1/1 **2016ApJS..225....1T**, **(13)** Survey paper and catalogue for the largest areal *Spitzer Space Telescope* programme.

MacLeod, Chelsea L.; **Ross, Nicholas P** et al. "*A systematic search for changing-look quasars in SDSS",* 10.1093/mnras/stv2997, **2016MNRAS.457..389M**, **(43)** Field-leading paper for CLQ studies; first systematic search with detailed theoretical interpretation.

Ross, Nicholas P. et al. *"Extremely red quasars from SDSS, BOSS and WISE: classification of optical spectra"*, 10.1093/mnras/stv1710 **2015MNRAS.453.3932R**, **(25)** The discovery paper for the new class of "Extremely Red Quasars".

Font-Ribera, Andreu; Kirkby, David; Busca, Nicolas; Miralda-Escudé, Jordi; **Ross, Nicholas P.** et al. "*Quasar-Lyman α forest cross-correlation from BOSS DR11: Baryon Acoustic Oscillations",* 10.1088/1475-7516/2014/05/027 **2014JCAP...05..027F** **(166)** Ground-breaking first detection of the "Baryon Acoustic Oscillation" phenomena in the quasar population.

Ross, Nicholas P. et al. "*The SDSS-III Baryon Oscillation Spectroscopic Survey: The Quasar Luminosity Function from Data Release Nine",* 10.1088/0004-637X/773/1/14 **2013ApJ...773...14R, (99)** Critical demographic "1-point" measurement of the BOSS quasar Sample (was a BOSS "Key Project").

Ross, Nicholas P et al. "*The SDSS-III Baryon Oscillation Spectroscopic Survey: Quasar Target Selection for Data Release Nine",* 10.1088/0067-0049/199/1/3, **2012ApJS..199....3R (179)** Overview of the work my team lead and a opus of using novel machine learning techniques for astrophysics research.

Pâris, I.; Petitjean, P.; Aubourg, É.; Bailey, S.; **Ross, Nicholas P.** et al. "*The Sloan Digital Sky Survey Quasar Catalog: Ninth Data Release"*, 10.1051/0004-6361/201220142, **2012A&A...548A..66P (184)** Production of the first catalogue and data release from the SDSS-III BOSS Quasar Survey.

Schneider, Donald P.; Richards, Gordon T.; Hall, Patrick B.; Strauss, Michael A.; Anderson, Scott F.; Boroson, Todd A.;, **Ross, Nicholas P.** et al. "*The Sloan Digital Sky Survey Quasar Catalog. V. Seventh Data Release",* 10.1088/0004-6256/139/6/2360, **2010AJ....139.2360S (588)** Production of the previous state-of-the-art quasar catalogue, with associated metadata.

Ross, Nicholas P et al. *"Clustering of Low-redshift (z <= 2.2) Quasars from the Sloan Digital Sky Survey,* 10.1088/0004-637X/697/2/1634, **2009ApJ...697.1634R (158)** Critical demographic `2-point' measurement of the SDSS Quasar Sample (was SDSS Quasar "Key Project").

PRIZES AND AWARDS

2014 - 2019	STFC Ernest Rutherford Senior Fellowship
2009 - 2016	*Architect* SDSS-III: Baryon Oscillation Spectroscopic Survey (BOSS)
2003 - 2008	PPARC Student Fellowship, *Durham University*

SELECTED LEADERSHIP

2018	P.I. Liverpool Telescope program: *The Optical Monitoring of IR-variable Quasar*s
2018 -	P.I. *JWST* Cycle 1 GO program: *Quasar Physics with the MIRI MRS* (to be submitted)
2017 -	P.I. WISE W4 Compendium (WW4C)
2016 - 2017	Co-founder and Chief Data Scientist of *String Security Inc.*
2014 - 2019	P.I., STFC Ernest Rutherford Fellowship
2013 - 2016	Co-P.I., *Spitzer Space Telescope* program "SpIES: The Spitzer-IRAC Equatorial Survey'"
2012 - 2014	Co-P.I., *Hubble Space Telescope,* program "High-Luminosity Obscured Quasars at z~2.5"
2011	Chapter Editor, *BigBOSS* NOAO Proposal, arxiv.org/abs/1106.1706v1
2011	P.I., SDSS-IV: BOSS-Plus (accepted Nov 2011; merged into SDSS-IV: eBOSS)
2009 - 2012	Chair, SDSS-III BOSS Quasar Working Group
2008 - 2010	Lead, SDSS-III BOSS Quasar Target Selection Group
2008 - 2010	P.I., NASA *Swift* Cycle 5 Long-term local AGN monitoring program

SELECTED PRESENTATIONS

2017 Nov	*Dealing With Data 2017 Workshop*	Selected Oral Contribution
2017 Jul	*Unveiling the Physics Behind Extreme AGN Variability*	Conference Summary
2017 May	University of Cambridge	Galaxies Discussion Group
2016 Jun	*JWST@ROE* conference	Contributed talk
2016 May	University of Michigan	Astrophysics Seminar
2016 May	Great Lakes Quasar Symposium	Oral Contribution
2015 Sep	*Multiwavelength AGN*, Crete	Invited Review
2015 Apr	Adler Planetarium, Chicago	Astrophysics Seminar
2015 Jan	225th AAS, Seattle	Special Session talk
2014 Sep	*Heritage of Stripe 82*, Princeton University	Invited talk
2014 May	Harvard University	HEAD talk
2014 Apr	University of Pennsylvania	Astrophysics Seminar
2013 May	Stanford University	KIPAC Talk
2011 Jul	Oxford University	BICAP Cosmology Seminar
2011 May	Yale University	YCAA Seminar