



# Calvin Sykes

Astronomy PhD Candidate  
Durham University

- 1995/08/06 (citizenship: UK)
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## Interests

- Cosmological simulations
- HI absorption statistics at  $z \sim 3$
- CGM structure and kinematics
- Radiative transfer

## Skills

### Programming

- Python + SciPy stack ●●●●●
- Fortran, C ●●●●○
- C++ ●●●●○

### HPC & Software

- Numba, Cython ●●●●○
- slurm ●●●●○
- LaTeX, Bash, Linux ●●●●○
- OpenMP, MPI ●●●●○
- Git ●●●●○

## Research Experience

- 2017 – present **Ph.D. researcher** Durham University, UK  
Developed an ionisation balance code to predict  $H\alpha$  fluorescence from gas in star-free dark matter haloes (RELHICs). Demonstrated that observations of these objects can provide constraints on the UV background and primordial helium abundance.  
Performed radiative transfer calculations with Cloudy to aid in analysis of observational data from *MUSE*.  
Ran suite of cosmological hydrodynamical simulations with radiative transfer post-processing, and performed analysis to investigate HI absorption statistics and absorber cross-sections.
- 2016 – 2017 **M.Phys. student** Lancaster University, UK  
Investigated the prospects for direct detection of a singlet scalar dark matter particle by the LUX experiment.

## Publications

- July 2019 **Fluorescent rings in star-free dark matter haloes**  
**C. Sykes**, M. Fumagalli, R. Cooke, T. Theuns, A. Benítez-Llambay  
*MNRAS*; 487(1), 609
- Oct. 2019 **Gas filaments of the cosmic web located around active galaxies in a protocluster**  
H. Umehata, M. Fumagalli, I. Smail, Y. Matsuda, A. M. Swinbank, S. Cantalupo, **C. Sykes**, R. J. Ivison, C. C. Steidel, A. E. Shapley, J. Vernet, T. Yamada, Y. Tamura, M. Kubo, K. Nakanishi, M. Kajisawa, B. Hatsukade, K. Kohno.  
*Science*; 366(6461), 97
- Feb. 2020 **Determining the primordial helium abundance and UV background using fluorescent emission in star-free dark matter haloes**  
**C. Sykes**, M. Fumagalli, R. Cooke, T. Theuns  
*MNRAS*; 492(2), 2151
- in prep. **The ENGINe simulations: exploring neutral gas in EAGLE**  
**C. Sykes**, M. Fumagalli, R. Cooke, T. Theuns  
*MNRAS*; to be submitted

## Education

### Postgraduate Study

- 2017 – present **Ph.D. in Astronomy** Durham University, UK  
**Completion expected:** 2021  
**Supervisors:** Prof. Michele Fumagalli, Prof. Ryan Cooke
- 2016 – 2017 **M.Phys. in Physics, Astrophysics and Cosmology** Lancaster Univ., UK  
**Title:** Constraints on singlet scalar dark matter from thermal history and direct detection.  
**Supervisors:** Dr. John McDonald  
**Grade:** 1<sup>st</sup> Class (82%)

### Undergraduate Study

- 2014 – 2016 **B.Sc. in Physics, Astrophysics and Cosmology** Lancaster Univ., UK  
**Grade:** 1<sup>st</sup> Class (81%)
- 2009 – 2013 **Secondary school** Knights Templar School, Baldock, UK  
**A-Levels:** Four (2A\*, 2A)  
**GCSEs:** Twelve (9A\*, 2A, 1B)

### Other Training

- August 2019 **SAMCRT Summer School** University of St. Andrews, UK  
Topics covered included Monte Carlo radiative transfer and radiation hydrodynamics

# Teaching Experience

## Undergraduate Courses

2018-19, 2020-21	<b>PHYS 1101: Discovery Skills in Physics</b> Delivered introductory Python programming workshops to first-year students
2019-20	<b>PHYS 3561: Computing Project</b> Mentored third-year students undertaking research-based programming projects

## Conferences and Presentations

June 2017	<b>Physics @ Lancaster Annual Conference</b> 15 min. talk	Lancaster, UK
July 2018	<b>Intergalactic Interconnections</b> Flash talk	Marseille, France
Dec. 2018	<b>Virgo Consortium meeting</b> 15 min. talk	Leiden, Netherlands
January 2019	<b>DEX XV Workshop</b> 15 min. talk	Edinburgh, UK
June 2019	<b>What Matters Between Galaxies</b> Flash talk and poster	Spineto, Italy
August 2019	<b>Small Galaxies, Cosmic Questions</b> 15 min. talk	Durham, UK
January 2020	<b>DEX XVI Workshop</b> 15 min. talk	Durham, UK
Various	Departmental 30 min. talks	Durham, UK

## Honours and Awards

January 2018	Prize for best talk at DEX XV workshop
January 2019	Runner-up for best talk at DEX XVI workshop

## Service

Outreach	Regular participation in departmental outreach events, including planetarium roadshows and annual "Celebrate Science" festival
Conference organisation	LOC member for "Small Galaxies, Cosmic Questions" conference and DEX XVI workshop
Part time work	Student Ambassador for Physics department, assisted in planning and running visit days for prospective undergraduate students
Volunteering	Activity leader at Scouts youth group in connection with the Duke of Edinburgh's Award scheme, which I have completed to Gold level Participated in mathematics mentoring scheme for A-level school students

## Personal

I enjoy outdoor pursuits, and have been an active member of university clubs including hiking, kayaking and climbing.

## References

Advisor	<b>Prof. Michele Fumagalli</b> michele.fumagalli@unimib.it	University of Milano-Bicocca, Italy
Advisor	<b>Prof. Ryan Cooke</b> ryan.j.cooke@durham.ac.uk	Durham University, UK
Collaborator	<b>Prof. Tom Theuns</b> tom.theuns@durham.ac.uk	Durham University, UK