Clara Sousa-Silva

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Profile

I'm a molecular astrophysicist quantum chemist. My interests lie with exoplanet characterisation and science education. I am experienced in handling complex mathematical problems and large data sets, and working in multidisciplinary teams. I am also an accomplished science communicator, with both scientific and non-scientific audiences of all ages. As the educational co-ordinator for the Twinkle space mission I supervised collaborations between young scientists and high school students for the production of astrophysics research - this project is now expanded to 45 current students from eight schools. I now focus on simulating approximate fingerprints for potential biosignatures at MIT.

Education

2011-2015 **PhD in Astrophysics - Modelling Phosphine Spectra for the Atmospheric Characterization of Cool Stars and Exoplanets**, *University College London*, *UK*,
Thesis submitted April 2015. PhD defended June 2015 and awarded September 2015.

2005-2010 **Integrated MPhys - Masters of Physics and Astronomy with Honours**,
University of Edinburgh, Scotland, *UK*, **2:1**, Masters Thesis: Grade **A**.
Thesis title: Influence of a Star's Evolution on its Planetary System

1995-2004 **High School Diploma**, *Portugal and New Zealand*, **A average**.

Employment

Sep 2016 - Ongoing **Postdoctoral Associate**, *Massachusetts Institute of Technology*, Cambridge, USA,
Joint post-doc at the Kavli Institute (MKI) and the department of Earth, Atmospheric and Planetary Sciences. Main project is ATMOS (Approximate Theoretical MOlecular Spectra) which combines organic chemistry and quantum physics to simulate spectra of potentially important volatiles. ATMOS is part of the biosignature detection research being led by Professor Sara Seager.

Jan 2015 - Sep 2016 **Twinkle's Educational Co-ordinator**, *University College London*, UK,
Co-ordinator for EduTwinkle, the outreach and educational programme for the Twinkle space mission. EduTwinkle aims to create a productive relationship between British schools and space missions, to widen participation in higher education by under-represented groups and to increase girls' uptake of STEM subjects at A-level and university.

Sep 2014 - Jul 2016 **Researcher in Schools**, *Brilliant Club/Goldman Sachs/King's College London*, UK,
Participant in the first cohort of the Researchers in Schools program, where scientists train as part-time science teachers alongside their research. Presently leading an action research project on the impact of classroom incorporation of career prospects at all key stages (Ages 11- 18). Active participation in outreach from primary schools to A-level, particularly focused on widening participation and addressing the gender imbalance in physics.
Qualified Teacher Status awarded in June 2015

Sep 2014 - Aug 2016 **HRA - Quantum Chemistry**, *University College London*, UK,
Honorary post-doctorate (funded by Goldman Sachs and RIS) researching the use of symmetry properties to produce molecular line lists with reduced resources (Phantom Symmetries) and the tunnelling motion of phosphine.

Sep 2011 - April 2012 **Demonstrator at the Mill Hill Observatory**, *ULO*, London, UK,
Teaching assistant for an introductory observational astronomy course as part of the UCL Certificate in Astronomy course. Roles included providing student support during theoretical tutorials and delivering practical classes using the Observatory's suite of telescopes..

Sep 2010 - Dec 2010 **Research Intern**, *Chemistry Department of the Institut Josef Stefan*, Ljubljana, Slovenia,
Duties included purchasing equipment and liaising with companies, organizing meetings and presentations, researching companies and their equipment, performing data analysis, software development and assisting in the laboratory.

Achievements and Skills

Communication and Outreach (excerpt)

Created the Twinkle Space Mission's educational program, EduTwinkle, and delivered a wide range of outreach projects from primary school age to undergraduate level. The highlight of this initiative is ORBYTS (Original Research By Young Twinkle Students) where students perform original research under the supervision of trained PhD students and other young scientists. This original research is on science relating to space exploration. The first of the peer-reviewed articles that have originated from ORBYTS has now been published in the Astrophysical Journal Supplementary Series, with three of the high school students as co-authors.

Spoke at 11 Downing Street about EduTwinkle and the value of bringing space exploration into the classroom (19th Feb 2015).

Presented EduTwinkle for the Twinkle launch at the Royal Astronomy Society (6th Feb 2015).

Participated in the discussion panel for the "Challenging Gender Stereotypes in Space Science" event at Goldman Sachs as part of the International Women's Day (24th Mar 2015).

Organized and delivered a set of activities about spectroscopy and the ethics of space exploration at the "Not Just An Astronaut" Careers Day for Yr 8 students at the National Space Laboratory (RAL) (6th April 2015).

Ran the "Rocket Science" project at Highams Park School, where young students (12-14 yrs old) perform all controlled experiments and analyse the impact of space travel on rocket (aka arugula) seeds growth parameters. Resulting research to be published in the fall of 2018.

Taught and presented research and EduTwinkle at several conferences and departments, including Cambridge, USA (MIT), Budapest (HRMS), Oxford (EAHS), Barcelona (CS17), Frejus (HiResMIR), Cambridge (EUKM), Warwick (UKEC), Sheffield (NSSC).

Languages

Fully fluent in English and Portuguese, with an intermediate level of French and Spanish.

Proficient user of Linux, LaTeX and MS Office packages.

Experienced in Java and Matlab, with emphasis on simulations, graphical analysis and user friendly interfaces.

Functional knowledge of Python, IDL and Fortran.

Publications

C Sousa-Silva, E J Barton, K L Chubb, M Gorman, L K McKemmish and J Tennyson,
Original Research By Young Twinkle Students (ORBYTS): When can students start performing original research?,
in preparation.

L K McKemmish, T Masseron, S Sheppard, E Sandeman, Z Schofield, T Furtenbacher, A G Csaszar, J Tennyson and C Sousa-Silva,
MARVEL Analysis of the Measured High-resolution Rovibronic Spectra of 48Ti16O,
The Astrophysical Journal Supplement Series, 228 (2), 15, 2017.

C Sousa-Silva, J Tennyson and S N Yurchenko,
Communication: Tunnelling Splitting in the Phosphine Molecule,
The Journal of Chemical Physics, 145 (9), 091102, 2016.

J Tennyson, S N Yurchenko, A F Al-Refaie, E J Barton, K Chubb, P J Coles, S Diamantopoulou, M Gorman, C Hill, L Lodi, L K McKemmish, Y Na, O L Polyansky, C Sousa-Silva, D S Underwood, A Yachmenev and E Zak,
The ExoMol Database: Molecular Line Lists for Exoplanet and Other Hot Atmospheres,
Journal of Molecular Spectroscopy, 327, 73-94, 2016.

C Sousa-Silva, A F Al-Refaie, J Tennyson, S N Yurchenko,
ExoMol line lists - VII: The Rotation-vibration Spectrum of Phosphine up to 1500K,
Monthly Notices of the Royal Astronomical Society, 446, 2337-2347, 2015.

C Sousa-Silva, N Hesketh, S N Yurchenko and J Tennyson ,
High Temperature Partition Functions and Thermodynamic Data for Phosphine and Ammonia,
Journal of Quantitive Spectroscopy and Radiative Transfer, 142, 66-74, 2014.

C Sousa-Silva, S N Yurchenko and J Tennyson,
A Computed Room Temperature Line List for Phosphine,
Journal of Molecular Spectroscopy, 288, 28-37, 2013.

C Sousa-Silva, G Veryasov, E Goreshnik, M Ponikvar and A Jesih,
Crystal Structure and Vibrational Spectra of Hydrazinium (+1) Fluorocadmate,
Monatshefte fur Chemie-Chemical Monthly, 144 (10), 1455-1459, 2013.