

# Dr Jack O'Malley-James

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CONTACT DETAILS      Carl Sagan Institute      *E-mail:*      jomalleyjames@astro.cornell.edu  
Cornell University      *www:*      www.jackomalleyjames.com  
304 Space Sciences Building  
Ithaca, NY 14853, USA

RESEARCH INTERESTS      My research interests lie at the intersection between astronomy, biology and geophysics, with a focus on exploring how life would influence exoplanet atmospheres, climates and detectable biosignatures. This involves modelling climate evolution, surface radiation environments and atmospheric photochemistry of habitable rocky exoplanets, then coupling the results to the physical and evolutionary limits of biology. Work like this not only helps to determine how to search for biosignatures on other worlds, but can also help us to build on our understanding of the complex interplay between the atmosphere, geosphere and biosphere here on Earth. This connection between other worlds and our own is the driving force behind my work.

WORK / EDUCATION      **Cornell University**, NY, USA  
Research Associate, Carl Sagan Institute (2015 - Present)

- Modelling exoplanet environments and remotely observable biosignatures.

**University of St Andrews**, St Andrews, UK  
PhD (STFC Aurora funded), Astrophysics / Astrobiology (2010 - 2014)

- Thesis Topic: The Biosignatures of Diverse Microbial Life
- Supervisors: Jane Greaves, Charles Cockell, John Raven

**University of St Andrews**, St Andrews, UK  
MRes Environmental Biology (for mathematical scientists) (2009 - 2010)

- Postgraduate research degree with distinction.
- Dissertation Topic: "The Potential for Oxygenic Photosynthesis in Binary Star Systems". Supervisors: John Raven, Charles Cockell.

**University of St Andrews**, St Andrews, UK  
MPhys Theoretical Physics (2004 - 2008)

- Dissertation Topic: "Statistical Dynamics of Interacting Fish Populations".

PROFESSIONAL EXPERIENCE      **Teaching:** Tutor & demonstrator: astrophysics, physics, observatory training (University of St Andrews, 2010-2014). Lecturer & undergraduate supervision: exoplanets, astrobiology (Cornell University 2015-2018).  
**Observer** at the James Gregory Telescope (the UK's largest operational optical telescope): University of St Andrews, UK (2012 to 2014).  
**Astrobiology Society of Britain:** Committee member (Jan 2013 to present).  
**Conference organiser:** Member of organising committees for the Emerging Researchers in Exoplanet Science Symposium (Cornell University, 2016) and the 7th Biennial Astrobiology Society of Britain Conference (Open University, 2017).  
**Reviewer/Referee:** *Journals:* Astrobiology, The Astrophysical Journal, Life, Futures. *Academic Publishing:* Cambridge University Press.

PROFESSIONAL MEMBERSHIPS      Royal Astronomical Society  
Astrobiology Society of Britain

TECHNICAL SKILLS      Detailed understanding of Linux-based operating systems and Microsoft Windows. Experienced with Office, L<sup>A</sup>T<sub>E</sub>X, Fortran, Mathematica and Python.

TEACHING  
EXPERIENCE

I have taught in a range of environments, from small group tutorials to lectures, covering solar system astronomy, observational astronomy, stellar evolution, galactic astronomy, mechanics, and astrobiology. I have been responsible for coordinating teaching and course assessment/grading.

- Co-coordinator for postgraduate seminar course on current issues in exoplanet science (Cornell University, 2018).
- Guest lecturer (exoplanets and astrobiology themes) for Astronomy 1101, 2201 courses (Cornell University, 2015; 2016; 2017; 2018).
- Undergraduate research project supervisor: “Exoplanet climate modelling” (Cornell University, 2017-18).
- Undergraduate research project supervisor: “Galactic habitable zone” (Cornell University, 2016-17).
- Undergraduate research project supervisor: “Cosmic rays and habitability” (Cornell University, 2015-16).
- Cornell REU (Research Experiences for Undergraduates) program lecturer: Habitable zones workshop; The Search for Life in the Universe (Cornell University, 2016).
- 4th year undergraduate level radio telescope lab demonstrator (2013-2014).
- Undergraduate physics and astronomy tutor/demonstrator for the University of St Andrews Gateway Programme (2011-2014).
- Part of a two person team tasked with training and testing undergraduate students on the 25 cm and 40 cm Meade telescopes at the St Andrews Observatory (2011-2014).
- Undergraduate astronomy tutor (small groups) and lab demonstrator (University of St Andrews, 2010-2014). Lead tutor and tutorial coordinator, 2012-2014.

CONFERENCES  
& MEETINGS

**Contributed/Invited Talks**

The Habitability of Highly UV-Irradiated Surfaces - *ERES III, Yale University, June 2017.*

The Habitability of Highly UV-Irradiated Surfaces - *AbSciCon, Phoenix, April 2017.*

Temporal & Alternative Biosignatures - *EANA, Athens, September 2016.*

Life at the End of Worlds: The Future of Earth’s Biosignatures - *ERES II, Cornell University, June 2016.*

In Search of Future Earths - *AbSciCon, Chicago, June 2015.*

Swansong Biospheres: Refuges for Life and Novel Microbial Biospheres on Terrestrial Planets Near the End of their Habitable Lifetimes - *Astrobiology Society of Britain Conference (ASB5), Edinburgh, April 2013.*

Light and Life: Exotic Photosynthesis in Binary and Multiple Star Systems - *European Astrobiology Workshop (EANA 2012), Stockholm, October 2012.*

Light and Life: Exotic Photosynthesis in Binary and Multiple Star Systems - *16th Evolutionary Biology Meeting, Marseille, September 2012.*

The Last Puddle on Earth: Refuges for Life on a Dying Planet - *STFC Astrobiology Summer School, September 2011.*

**Posters**

Lessons from Earth: Our guide to characterising irradiated habitable worlds - *Exoplanets II, Cambridge, UK, July 2018.*

UV Surface Environments on Habitable Worlds - *Simons Collaboration on the Origins of Life Annual Symposium, Simons Foundation, New York, May 2017.*

Biofluorescence as a Temporal Biosignature - *Simons Collaboration on the Origins of Life Annual Symposium, Simons Foundation, New York, May 2016.*

Mars as an Analogue for an End-Stage Habitable Planet - *ASB Life in the Cold meeting, Leeds, October 2013.*

Swansong Biospheres: Refuges for life and novel microbial biospheres on terrestrial planets near the end of their habitable lifetimes - *UK National Astronomy Meeting (NAM), St Andrews, July 2013.*

Swansong Biospheres: Refuges for life and novel microbial biospheres on terrestrial planets near the end of their habitable lifetimes - *IAUS 299, Victoria, June 2013.*

The Last Puddle on Earth: Refuges for life on a dying planet - *São Paulo Advanced School of Astrobiology (SPASA), São Paulo, December 2011.*

Exotic Photosynthesis in Binary Star Systems - *AbGradCon, Bozeman, MT, June 2011.*

Exotic Photosynthesis in Binary Star Systems - *UK National Astronomy Meeting (NAM), Llandudnu, April 2011.*

### Other

*Breakthrough Discuss*, Stanford University, April 2017 (part of the Breakthrough Initiatives conference programme).

*Emerging Researchers in Exoplanets*, Penn State, May 2015.

*UKCA Building Habitable Worlds Workshop*, Edinburgh, February 2014.

*UK Space Environments Conference*, Aberdeen, June 2012.

*STFC graduate course on Exoplanets and their host stars*, Oxford, March 2012.

### AWARDS

- Travel grant for European Astrobiology Network Association meeting, Athens 2016.
- Travel grant for ASB Life in the Cold Workshop, Leeds, 2013.
- *FAPESP* funded place at the São Paulo Advanced School of Astrobiology 2011
- Poster prize at NAM 2011, Llandudno 2011.

### PRESS COVERAGE

My work has been covered in a range of print publications, including the *New Scientist*, *Wired Magazine*, *National Geographic*, *Science et Vie*, and *A&G Magazine*. I have also given live and recorded radio and television interviews for the BBC (*World Service*, *Radio 4*, *World News Channel*) as well as for various international broadcasters.

### OUTREACH

- Public Lecture: “The Search for Life Begins at Home”, *Fuertes Observatory*, Cornell, Mar 2018.
- Invited guest writer for *Cornell Cosmic*, an annual Cornell journal analysing and debating the future of space research and exploration from the perspectives of various fields, from science and the humanities, to politics and law. (Jan 2018).
- Took part in a series of public events commemorating the 40th anniversary of the *Voyager* space probe launch: “40 Years of Cosmic Discovery: Celebrating the *Voyager* Missions and Humanity’s Message to Space”, Oct 2017.
- Appeared in the NHK documentary ‘*Cosmic Front (Journey to the Earth’s Future)*’, March 2016.
- Science consultant for the BBC’s *Horizon*, *Human Universe* and *Stargazing Live*.
- The Wellcome Trust’s *Clover Project* space-themed dinner event, London (April 2015). Invited to talk to game designers creating biologically realistic alien worlds.
- Project advisor for an International Baccalaureate astrobiology project (*Lycée Paul-Claudé*, Paris): “What would extraterrestrial life look like?”
- Public talk for the *Kensington Celebration of Science* event: “Understanding Science; the past, present and future of the earth and its people”, September 2013.
- Organiser and demonstrator for the *Fife Science Festival* (2011, 2012, 2013, 2014); a family science event held at the University of St Andrews.
- Outreach astronomer for observatory open nights in St Andrews. Including operating the two Meade telescopes and answering questions from the public.
- Primary school astronomy. Gave introductory talks about the night sky to various age groups using a mobile, inflatable planetarium.
- Popular science article: “Exotic Photosynthesis in Binary Star Systems” in ***l’Astrofilo***.