ESTELLE JANIN

PhD Candidate – Extraterrestrial Life Detection

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INTERDISCIPLINARY RESEARCH

PhD dissertation - Project n°1

Life Detection through the Assembly of Planetary Atmospheres

Aug. 2022 – Ongoing ASU

- Apply Assembly Theory to the chemistry of planetary atmospheres
- Build a new framework for the interpretation of atmospheric data and the detection of life on exoplanets
- Supervised by Sara Walker and Mike Line

PhD dissertation - Project n°2

Life Detection through Extraterrestrial Communication

Aug. 2022 – Ongoing ASU

- Apply Assembly Theory to the emergence and evolution of Language
- Build a new framework for the interpretation of radio data and the detection of goal-directedness from extraterrestrial communication
- Supervised by Sara Walker, Philip Mauskopf and Patrick Young

ELIFE Collaborative Project

Network Theory for Planetary Atmospheres

Aug. 2021 – Ongoing ASU

- Investigate the detectability of topological reaction networks in terrestrial atmospheres, and distinguish abiotic vs. biotic pathways
- With Tessa Fisher, supervised by Sara Walker

Berggruen Institute Science Contractor

Life, Otherwise

June 2023 – Ongoing Remote

- Make the Strange Familiar: create an interactive platform with an imaginary stellar system featuring exoplanets with different alien biospheres
- Large collaboration between scientists, anthropologists and graphic designers, with outputs ranging from rigorous planetary simulations to essays and art pieces
- Supervised by Claire Webb

NASA Collaborative Projects

Exoplanet spectroscopy and radiative transfer in atmospheres

Aug. 2019 – Ongoing NASA GSFC & Remote

- Active member of the Biosignature Possibilities subgroup in preparation of the Habitable Worlds Observatory
- Detectability of CO_2 in TRAPPIST-1e-like exoplanet atmospheres
- Model intercomparison study of radiative transfer tools for exoplanet atmospheres
- Part of the organisational committee of the BUFFET-2 workshop (exoplanet model intercomparison)
- Host of the NASA GSFC exoplanet seminar series
- Supervised by Thomas Fauchez, Geronimo Villanueva and Ravi Kopparapu

Complex Systems Summer School

Exploratory research projects around complexity science

June-July 2023 Santa Fe Institute

- Simulating the life-cycle of scientific theories
- The structure of Abstraction: Word embeddings and Poincaré maps

EDUCATION

PhD Astrophysics

Supervised by Prof. Sara Walker

2022 – Ongoing Arizona State University

- School of Earth and Space Exploration
- **First project:** Assembly of Planetary Atmospheres: A Complex Systems Approach to the Detection of Extraterrestrial Life
- **Second project:** Language Emergence and Evolution: Insights for SETI (supervised by Paul Davies)
- **Current GPA:** 4.0
- Undergraduate Honor's Thesis supervision of Cameron Brooks, working on pulsars and extraterrestrial communication

MSci Natural Sciences

Astrophysics and Molecular & Cell Biology

2018 – 2022 University College London

- Average: 85%

French Scientific Baccalaureate

Highest Honours: 19.63/20

2015 – 2018 Lycée Hoche, France

TEACHING

SES 376/377

Spring 2025 Arizona State University

Communicating Astronomical and Planetary Sciences, with Prof. Karen Knierman

AWARDS

- **2023 Origins of Life Scholarship** to attend the Complex Systems Summer School ($5100)
- **2023 Career Development Award** - ASU GPSA ($950)
- **2022 ASU First Year Fellowship** (funds for one year of research)
- **2022 UCL Dean's List**: top 5% of graduating students
- **2022 Tessella Prize**: best use of software in final year project
- **2021 Best Natural Sciences Literature Report**

RESEARCH VISITS

University of Glasgow

July 2024 Glasgow, UK

- invited by Lee Cronin

Earth-Life Science Institute

Sept. 2023 Tokyo, Japan

MAPS Summer Internship

Chemical disequilibrium in exoplanet atmospheres

June-July 2022 — UCL

- Investigate and improve a chemical disequilibrium code (FRECKLL) in the context of atmospheric models and retrievals (TauREx)
- Supervised by Prof. Tinetti and Dr. Changeat

Master's Thesis

Modelling transitional planets: from planetary formation to atmospheric characterisation

Oct. 2021 – May 2022 — UCL

- TauREx-enabled population study of 18 exoplanets
- Investigate the atmospheric properties and detectability of Ocean Worlds
- Supervised by Giovanna Tinetti and Quentin Changeat, with inputs from Tadahiro Kimura (NAOJ, Japan)

Third Year Dissertation

Exoplanet biosignatures: past, present and future

Sept. 2020 – June 2021 — UCL

- Thorough review and critical assessment of the evolution of the field, its current status and its complex interdisciplinary feedbacks
- Supervised by Prof. Tinetti

International University Mars Rover Challenge

Leader of the UCL Science Team

2019 – 2022 — UCL

- Designing and building a rover with an on-board science cache able to discriminate between extant, extinct and absent life

PUBLICATIONS

Lead Author

- Janin, Estelle. (2021), "Exoplanet biosignatures", *Astronomy & Geophysics*, 62(6), 6.26–6.33
- Janin, Estelle. (2022), "Planetary Habitability.", *Observatory*, 142(1290), 239-240.

Co-author

- Fisher T., Janin E., Walker S. (2025) "A Complex-Systems Approach to Exoplanet Atmospheric Chemistry: New Prospects for Ruling Out the Possibility of Life-As-We-Know-It". *Planetary Science Journal*, 6 (5), 116.
- Barnes et al. (2025) "History and Habitability of the LP 890-9 Planetary System". *The Planetary Science Journal*, 6(1), 25
- Fisher et al. (2024) "Network and Kinetics-based Biosignatures: Implications for the Putative Habitable World Observatory Design". *Submitted HWO Science Case Document (Prephase A)*
- Villanueva et al. (2024) "Modeling Atmospheric Lines By the Exoplanet Community (MALBEC) protocol version 1.0". *The Planetary Science Journal*, 5(64)
- Edwards et al. (2023) "Characterising a World Within the Hot Neptune Desert: Transit Observations of LTT 9779 b with HST WFC3". *The Astrophysical Journal*, 166(4), 158
- Fauchez et al. (2021) "TRAPPIST Habitable Atmosphere Intercomparison (THAI) Workshop Report". *The Planetary Science Journal*, 2(3), 106-134

- invited by Harrison Smith

Space Telescope Science Institute

May 2023 — Baltimore, US

- invited by Quentin Changeat

WORKSHOPS & CONF.

Building a Unified Framework For Exoplanet Treatments (BUFFET)

Oct. 2024 — Remote
Oct. 2023 — Remote
Oct. 2022 — Remote
Sept. 2021 — Remote

Exoplanets 5

June 2024 — Leiden, NL

Habitable Worlds Observatory START-TAG meeting

June. 2024 — Baltimore, US

EvoLang

May 2024 — Madison, US

AbSciCon

May 2024 — Providence, US

Communicating Discoveries in the Search for Life in the Universe

March 2024 — remote

Society for Literature, Science and the Arts - ALIEN

Oct. 2023 — Phoenix, US

Sagan Exoplanet Workshop

July 2023 — Remote

AbGradCon

May 2023 — La Jolla, US

Open-Access Exoplanet Modeling & Analysis Tools

Feb. 2023 — Remote

VPLanet LP 890-9 simulations

Sept. 2022 — Remote

ARIEL Science Consortium

June 2022 — Paris, FR

The future role of Academia in the Space sector

Nov. 2021 — London, UK

ARIEL Science Consortium

Nov. 2021 — London, UK

Standards of Evidence for Biosignatures

July 2021 — Remote

TRAPPIST Habitable Atmosphere Intercomparison (THAI)

Sept. 2020 — Remote

ACADEMIC TALKS AND OUTREACH

Talks

Proxima Kósmos: A Speculative Exploration of Life Beyond Earth (March 2025 – Getty PST Open House)

Searching for Life-As-We-Don't-Know-It: Detecting Signatures of Chemical Selection in Planetary Atmospheres (Nov. 2024 – APEX Seminar)

Assembly of Planetary Atmospheres: A New Conceptual Narrative for the Characterization of Habitable Planets (June 2024 – AbSci-Con)

Recognizing Alien Languages: How Astrophysics and Linguistics come together (Oct. 2023 – SLSA 2023)

Assembly of Planetary Atmopsheres: A Complex Systems Approach to the Search for Extraterrestrial Life (Sept. 2023 – ELSI Seminar)

Assembly Theory: Why and How it will impact Astrobiology (Apr. 2023 – AZ Astrobio Symposium)

Water and Hydrogen: A promising planetary couple (June 2022 – UCL MAPS Talks)

Biosignatures: Past, Present, Future (Oct. 2021 – APEX Seminar)

Interdisciplinarity in Science: Insights from Astrobiology (Apr. 2021 – UK National Natural Sciences Conference)

CO_2 in Terrestrial Exoplanet Atmospheres (Oct. 2019 – APEX Seminar)

Posters

Assembly of Planetary Atmospheres: Towards a New Agnostic Framework for Data Interpretation and Life Detection (June 2024 – Exoplanets 5)

Assembling Planetary Atmospheres: Towards an Agnostic Framework for Life Detection on Exoplanets (May 2023 – AbGradCon)

Outreach

Beyond Center For Fundamental Concepts in Science: Student Helper (Jan. 2023 - Ongoing)

Astrobiology SciComm Guild Network (Jan. 2023 - Ongoing)

Creation of the website *AstroMatters* (Summer 2021)

Missions to Mars at Your Universe Festival (Mars 2020)

Physics Film Makers at UCL (2020)

REFEREE WORK

Bartlett et al. (2024), "The Physics of Life: Exploring Information as a Distinctive Feature of Living Systems". *Submitted to PRX Life*

COMPUTING SKILLS

TauREx (forward model and retrieval)
Planetary Spectrum Generator (PSG)
AssemblyCalculator
GGChem
Atmos
VPLanet
Python
Matlab

LEADERSHIP POSITIONS

UCL Space Society

President **2021 – 2022**
Head of Philosophy **2018 – 2021**

UCL Centre for Outer Space Studies

Organisational Committee **2021 – 2022**

UCL Space Domain

Organisational Committee **2021**

UCL SciCon

Event officer **2020 – 2021**

UCL Francophone Journal

President **2019 – 2020**

ConScience

Founder and President **2016 – 2019**

- Talks and 'science shows' in underprivileged French schools

ADDITIONAL COURSES

Complex Systems Summer School

June-July 2023 Santa Fe Institute

EANA Spring School

Hydrothermal Vents

May 2021 Remote

Princeton Summer School

Physics of Life

June 2020 Remote

Amity Astrobiology Course

Fall 2020 Remote