PROFILE

Assistant Professor

MARTA FILIPA SIMÕES

Astromycology Leader | Fungal Systems for Space & Extreme Environments | International PI and Collaborator

SHORT BIO

Marta Filipa Simões is a microbiologist specialising in astromycology, fungal ecology, and biotechnology for space exploration. Based in Macau, she leads research on fungal biodiversity, adaptation, and bioprocesses under extraterrestrial analogue conditions, including altered gravity, extreme environments, and artificial lunar and Martian regoliths.

With a multidisciplinary background, from environmental, marine, clinical, to industrial microbiology, her work explores fungal resilience, biosynthesis, pathogenicity risks in space, and applications for *in situ* resource utilisation (ISRU). She has held research positions in Portugal, the UK, and Saudi Arabia and actively collaborates across Europe, Asia, and Portuguese-speaking countries.

RESEARCH QUESTIONS AND VISION

- How do fungi adapt, survive, and function under extraterrestrial stressors?
- Can fungal systems be standardised and scaled for space biotechnology and ISRU?
- What are the implications of fungal behaviour in space for pathogenicity and planetary protection?

EDUCATION

- Postgraduate Certificate in Teaching in Higher Education (PGCTHE) – Edge Hill University (UK) (2019)
- Ph.D. in Chemical and Biological Engineering – University of Minho (PT) (2013)
- Master in Clinical Microbiology – Faculty of Medicine, University of Lisbon (PT) (2009)
- Bachelor (Licenciatura) in Biotechnological Engineering – ULHT (PT) (2006)

ORCID: 0000-0002-8767-9487
Twitter: @Simoes_MF

FUNGAL AND ASTROBIOLOGY RESEARCH

msimoes@must.edu.mo
marta.simoes.pt@gmail.com

EXPERTISE

Assistant Professor

MARTA FILIPA SIMÕES

Astromycology Leader | Fungal Systems for Space & Extreme Environments | International PI and Collaborator

PROFESSIONAL EXPERIENCE

Academic Appointments

- **Assistant Professor** (2021–present) Macau University of Science and Technology (MUST), Macau SAR. Lead PI in astromycology and space biotechnology; directing multidisciplinary projects on fungal adaptation, space environments, and ISRU applications.

- **Postdoctoral Fellow (2019–2021)** Macau University of Science and Technology (MUST), Macau SAR. Research in fungal ecology, extreme environments, and space-analogue systems.

Previous Research Positions

- **Associate Tutor & Junior Research Fellow** (2016–2019) Edge Hill University, UK. Research on fungal biodiversity in uncommon and extreme terrestrial environments.

- **Postdoctoral Fellow (2014–2015)** King Abdullah University of Science & Technology (KAUST), Saudi Arabia. Marine microbiology and environmental microbiology research.

- **Curator (2010–2013),** Micoteca da Universidade do Minho (MUM), University of Minho, Portugal. Culture collection management and fungal taxonomy.

Early Research Roles (2009–2010)

- Researcher, EMbaRC – European Consortium of Microbial Resources Centres, University of Minho, Portugal. Data management & microbial resources networking.

- Researcher, Centre for Molecular Pathogenesis, University of Lisbon. Mycobacteriophage gene characterisation and antimicrobial studies.

- Researcher, Faculty of Pharmacy, University of Lisbon. Microbial pathogenicity and drug development research.

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ACHIEVEMENTS AND PROGESS

Field sampling at salterns in Cabo Verde.

KEY PUBLICATIONS (latest)

Flagship Works

Baxter, KJ, ..., **Simões, MF**, et al. (2025). Biofilms: From the cradle of life to life support. npjBiofilms and microbiomes.

Simões, MF*, et al. (2023). The relevance of fungi in astrobiology research – Astromycology. Mycosphere 14(1): 1190–1253.

Wu, J-H, ... , **Simões, MF**, et al. (2022). The archaeal class Halobacteria and astrobiology: Knowledge gaps and research opportunities. Frontiers in Microbiology 13:1023625.

Méndez, A, ..., **Simões, MF**, et al. (2021) Habitability Models for Planetary Sciences. Astrobiology 21:8.

Simões, MF & Antunes, A (2021) Microbial pathogenicity in space. Pathogens 10(4):450.

Space Biotechnology, Stress Adaptation & Life-Detection

Simões, M F*, et al.(2020) Biogenic Metal Nanoparticles: A New Approach to Detect Life on Mars?. Life, 10(3), 28.

DasSarma, P, Antunes A, **Simões, MF**, et al.(2020) Earth's Stratosphere and Microbial Life. Current Issues in Molecular Biology 38:197-244.

Wang, S-Y, ..., **Simões, MF**, et al. (2025). Discovery of the dipicolinic acid synthase in the spoilage fungus *Paecilomyces* reveals its role in spore heat, salt, and alkaline pH resistance. Food Research International, 115994.

Nanotechnology & Applied Mycology

de Oliveira, ALP, ..., **Simões, MF**, et al.(2025). Implementation of a packed bed reactor with mycological silver nanoparticles for drinking water disinfection. CleanMat 2(3):230-241.

Trotta, C., ..., **Simões, MF**, & Ottoni, CA (2025). Marine mycosilver nanoparticles: Screening, evaluation of their antimicrobial properties and synthesis optimization. Sustainable Chemistry 6(1):10.

Simões, MF*, et al. (2020) Mycogenic metal nanoparticles for the treatment of mycobacteriosis. Antibiotics 9(9):569.

Environmental Engineering, Biomineralization & Circular Bioeconomy

Zhang, J, ..., **Simões, MF**, et al. (2025). Transforming MSWI fly ash and waste glass into hierarchical pores of foam glass-ceramics for effective adsorption. Construction and Building Materials 494:143510.

Zhang, J, **Simões, MF**, et al. (2025). Co–upcycling hazardous solid wastes of MSWI fly ash and secondary aluminum ash into iron and glass ceramic foams. Resources, Conservation & Recycling 215:108082.

Zhang, J, ..., **Simões, MF**, et al. (2024). A review of biomineralization in healing concrete: Mechanism, biodiversity, and application. Science of the Total Environment 170445.

MORE DETAILS HERE:

- https://scholar.google.co.uk/citations?user=sm5g6nsAAAAJ&hl=en&oi=sra
- www.researchgate.net/profile/Marta_Simes
- www.linkedin.com/in/martafilipasimoes

Fungal morphological characterisation.

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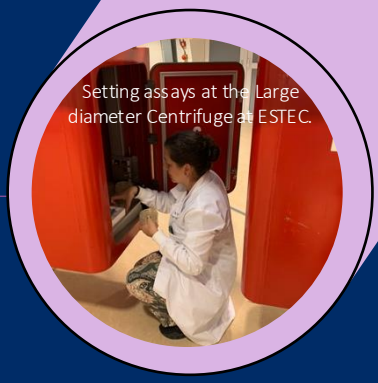
ACHIEVEMENTS AND PROGESS


Setting assays at the Large diameter Centrifuge at ESTEC.

GRANTS (current & recent)

• 2026-2029: “Urgent life support research for upcoming space missions: a Brazil-Macau initiative on fungal survivability, adaptation, and resilience to extraterrestrial stressors– **UrgeXstress**”. Funding from Macau Science and Technology Development Fund (FDCT - 0013/2025/ASJ): PI.
• 2024-2026: “Mitigating Outer-planetary Risks: Fungal Adaptation in Space exploration – **M.O.R.SpaceEx**”. Funding from Macau Science and Technology Development Fund (FDCT - 0033/2024/ITP1): PI.
• 2023: HyperGES fellowship, joint programme of United Nations Office for Outer Space Affairs (UNOOSA) and European Space Agency (ESA): **HyperSpacEx** – Medical and Biotechnological potential of Fungi in Hypergravity for Space Exploration (Netherlands): PI.
• 2022-2023: **MBF_SpacEx**: Medical and Biotechnological potential of Fungi for Space Exploration, FRG-22-080-LPS. Faculty Research Grants (FRG), Macau University of Science and Technology (Macau): PI.

International & Collaborative Projects

• 2024-2029: “National Institute for Identification, Quantification, Dispersion, Environmental Risks and Mitigation of Pollution by Emerging Contaminants in Marine and Coastal Environments – **CEMA**R”. Funding from Brazil’s National Institutes of Science and Technology (INCT), Brazil’s National Fund for Scientific and Technological Development (FNDCT), and the participation of nine state research foundations, alongside federal agencies such as CAPES and the Ministry of Health. The project, coordinated by Brazil (São Paulo State University; Institute for Energy and Nuclear Research; Federal University of Alfenas); in partnership with Portugal (University of Lisbon and University of Minho); and Macau (SKLPlanets at MUST and Institute of Science and Environment at USJ): Collaborator.
• 2023-2024: Simulated microGravity effects on Fungal Genomics – **GFG**. Open Project, State Key Laboratory of Lunar and Planetary Sciences, Macau University of Science and Technology (Macau): Co-PI, collaboration with Giovanna Cristina Varese (Turin University, Italy).
• 2021-2024: **B3iS** – Biodiversity and Bioprospection of Biosurfactants In Saline environments; FCT (PT): Collaborator.
• 2021-2023: Development and validation of a low-cost, bio- and nano-based innovative technology for drinking water disinfection, project with collaborators from São Paulo State University (UNESP), MUST (Macau), and Aveiro University (Portugal). Funding from FAPESP (The São Paulo Research Foundation, Brazil): Collaborator .

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OUTREACH ENGAGEMENT

Marta is highly engaged with different organisations and societies to promote the dissemination of science, particularly microbiology, and astrobiology, as well as to develop answers to environmental concerns and space exploration.

- Member and champion of the Microbiology Society (https://microbiologysociety.org), and part of the Editorial Board of *Microbiology Today*, the society's membership magazine (https://microbiologysociety.org/members-outreach-resources/microbiology-today.html).
- Member of the Applied Microbiology International (AMI, https://appliedmicrobiology.org), and part of the Climate Action Advisory Group (CAAG).
- Member and Macau coordinator of the Portuguese Language Office of Astronomy for Development (PLOAD, https://pload.org), developed by the Office of Astronomy for Development – International Astronomical Union (IAU).
- Member of the Macao Association for Scientific Cooperation between China and Portuguese Speaking Countries (ASCMAC; www.ascmac.org).
- Part of the Network of European Researchers in Biology and Medicine in China (NERBIMEC – https://euraxess.ec.europa.eu/worldwide/china/network-european-researchers-biology-and-medicine-china).
- Member of the Origins of Life Early-career Network (OoLEN, www.oolen.org).
- Part of the Astrobiology Society of Asia-Pacific (ASAP, https://astrobiology.asia).
- Member of the "Lusophone Network of Microbiology" and coordinator from Macau University of Science and Technology (https://redelusofonamicrobiologia.wordpress.com).

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