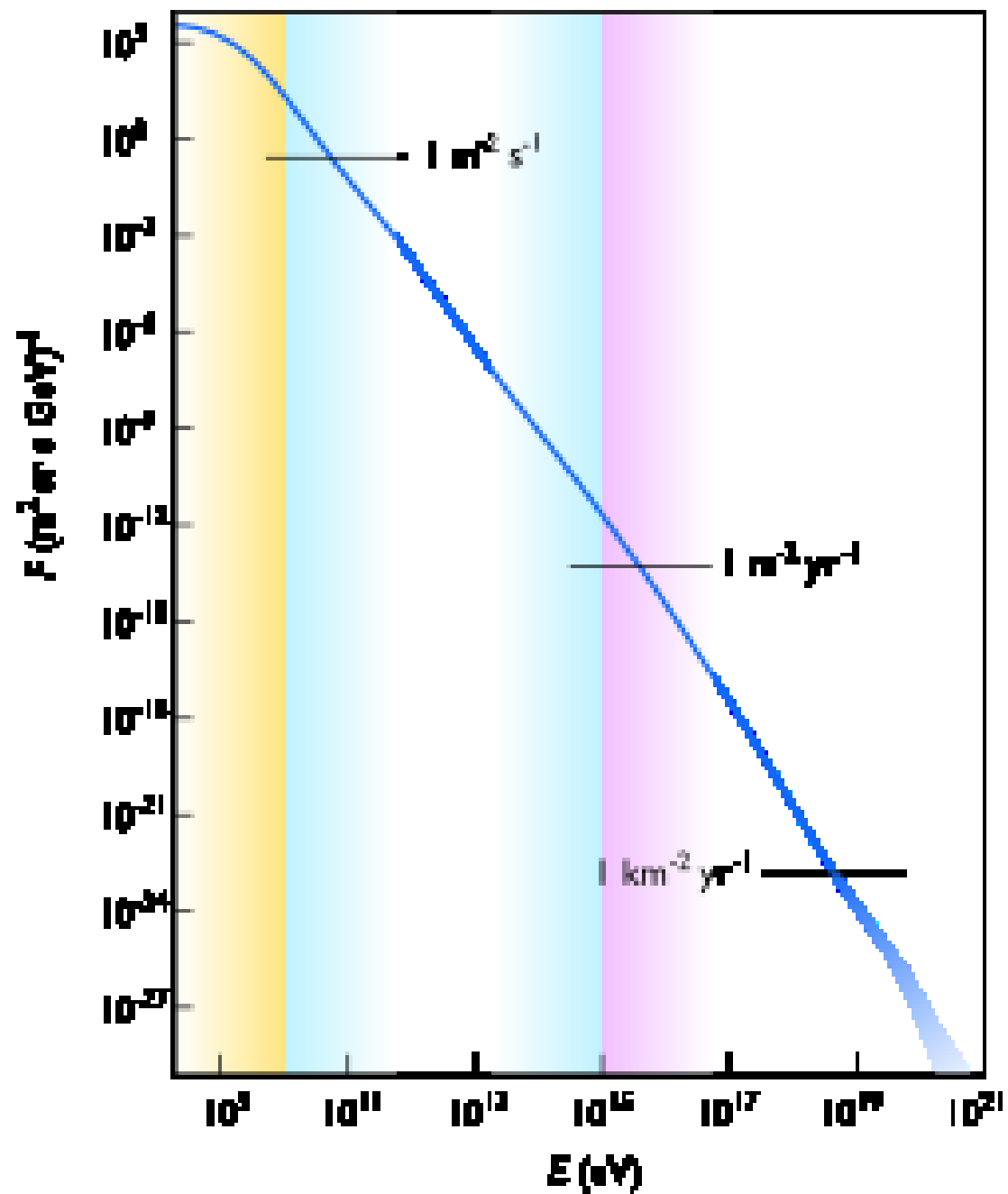


# Protection from Ionizing Radiation in Space

*Luigina Feretti, Istituto di Radioastronomia INAF*

*Space Renaissance International*

*Living in Space, 13 November 2025*

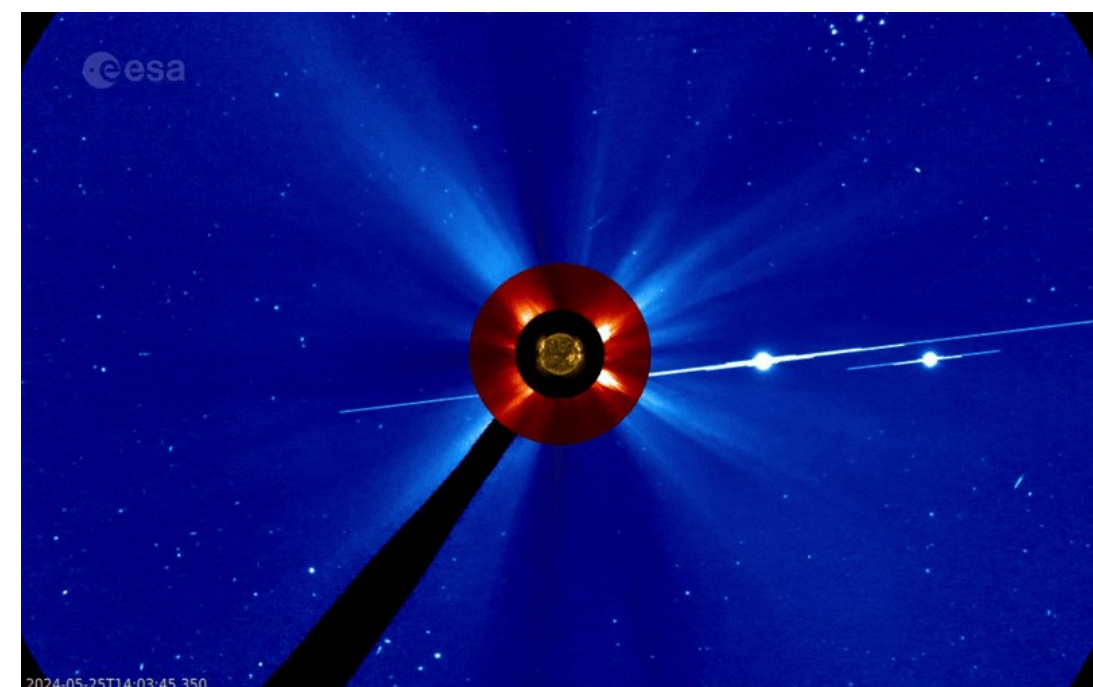
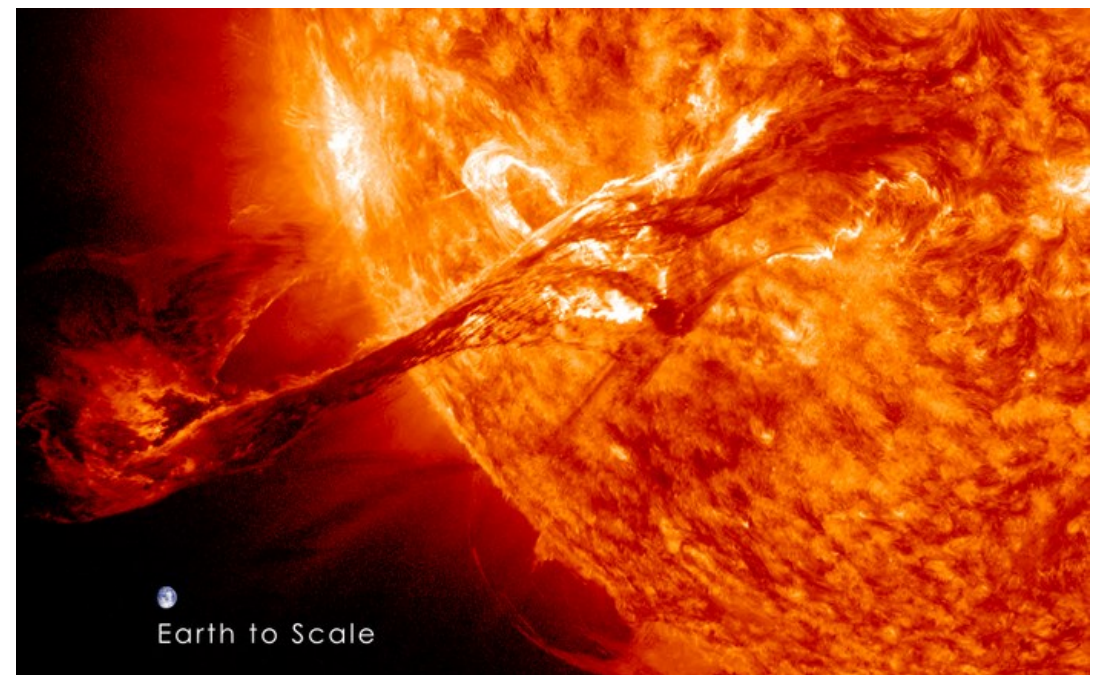
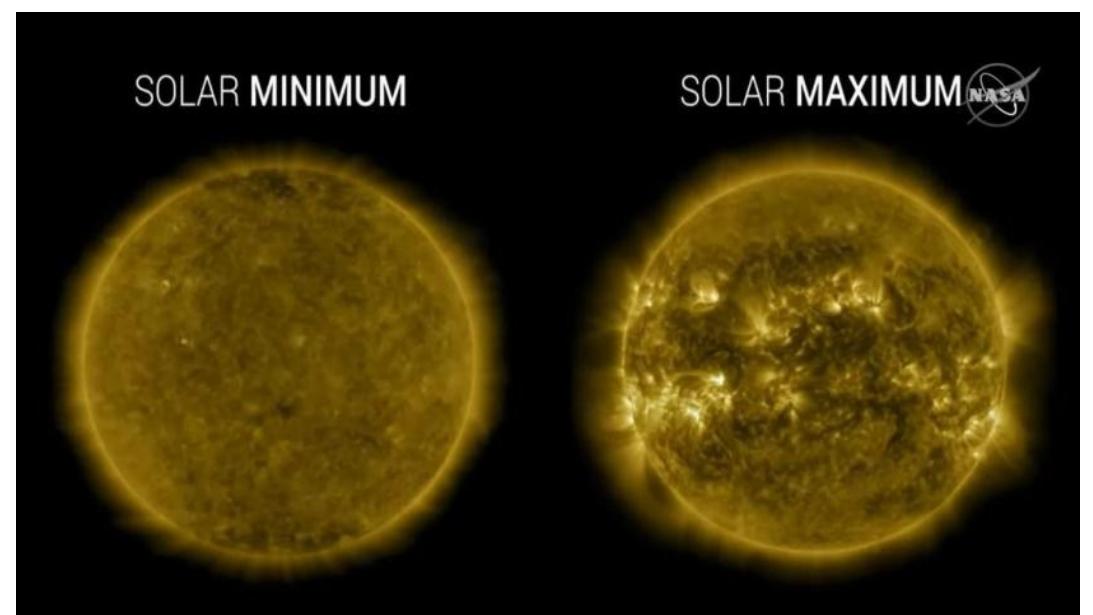


Flux of cosmic rays as a function of their energy

YELLOW: solar origin

BLUE: galactic origin

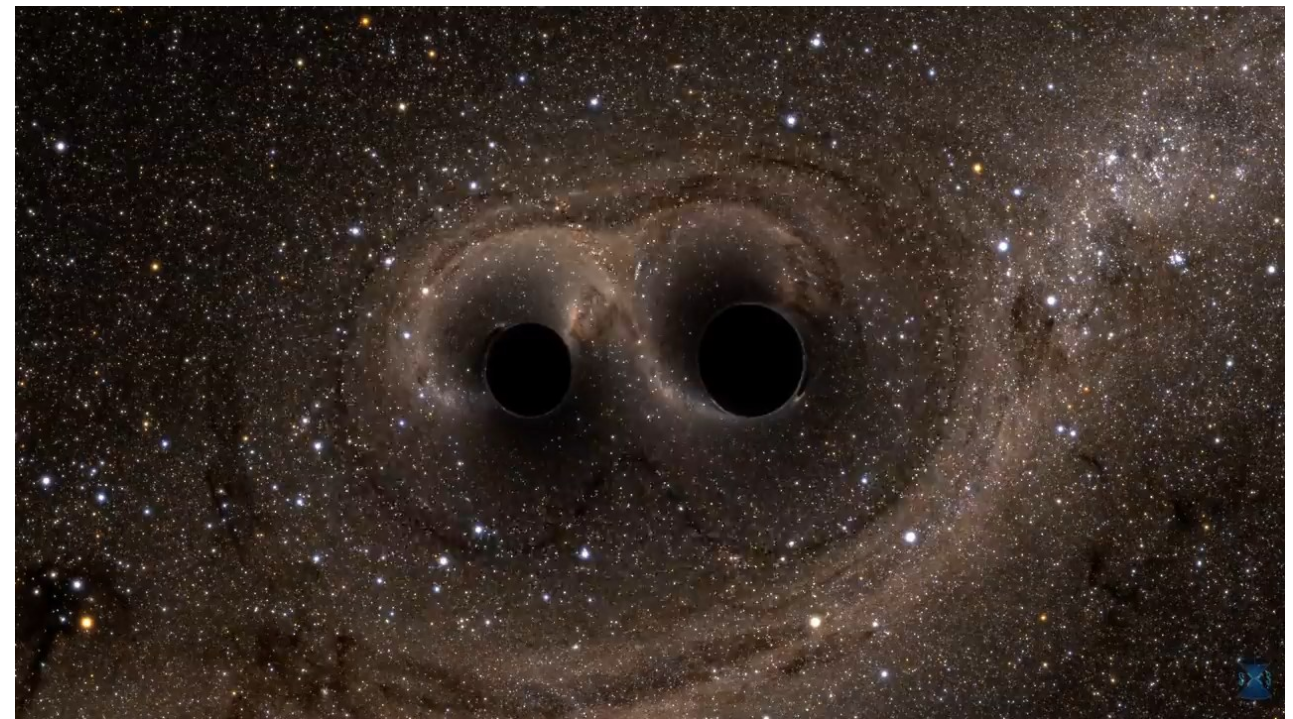
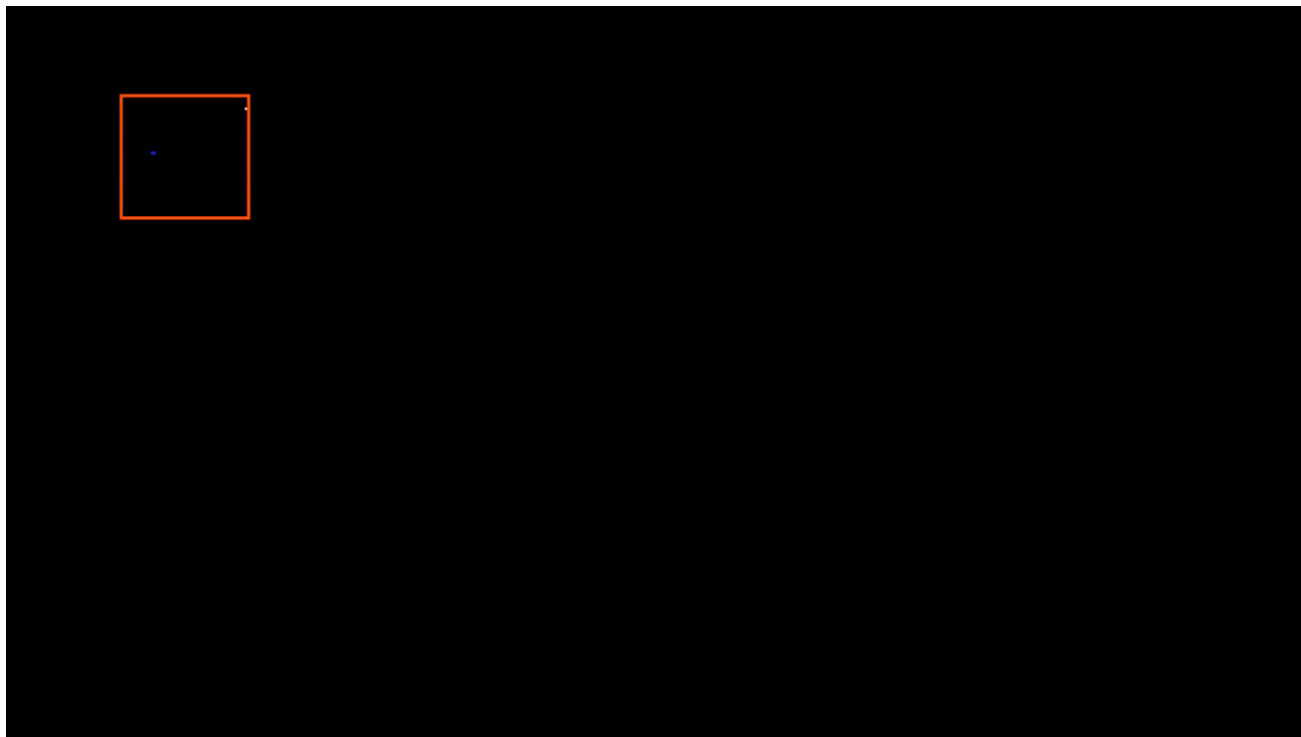
PURPLE: extragalactic origin





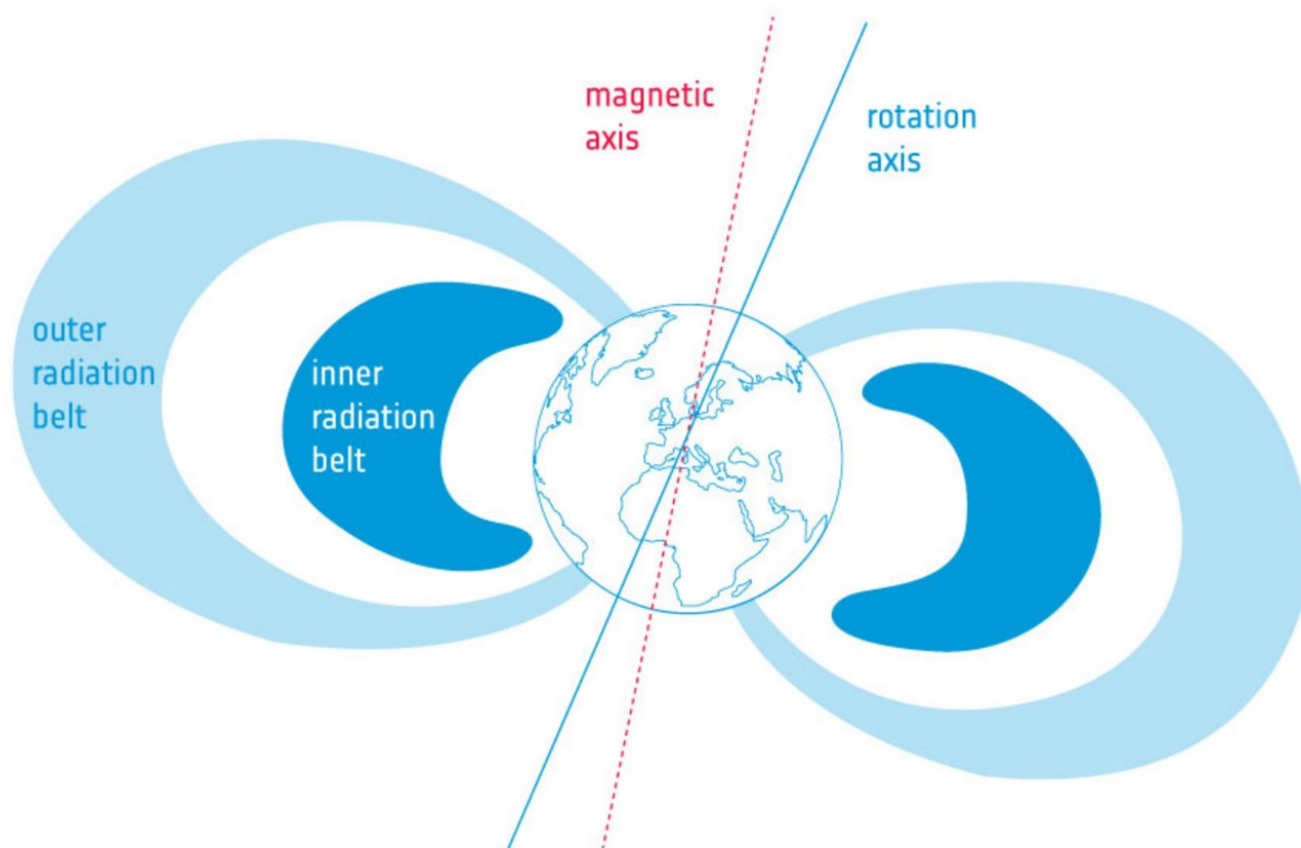
SuperNova explosion

Mergers of stars, neutron stars,  
black holes





Solar wind



Magnetic Field Extent  
~65000 km

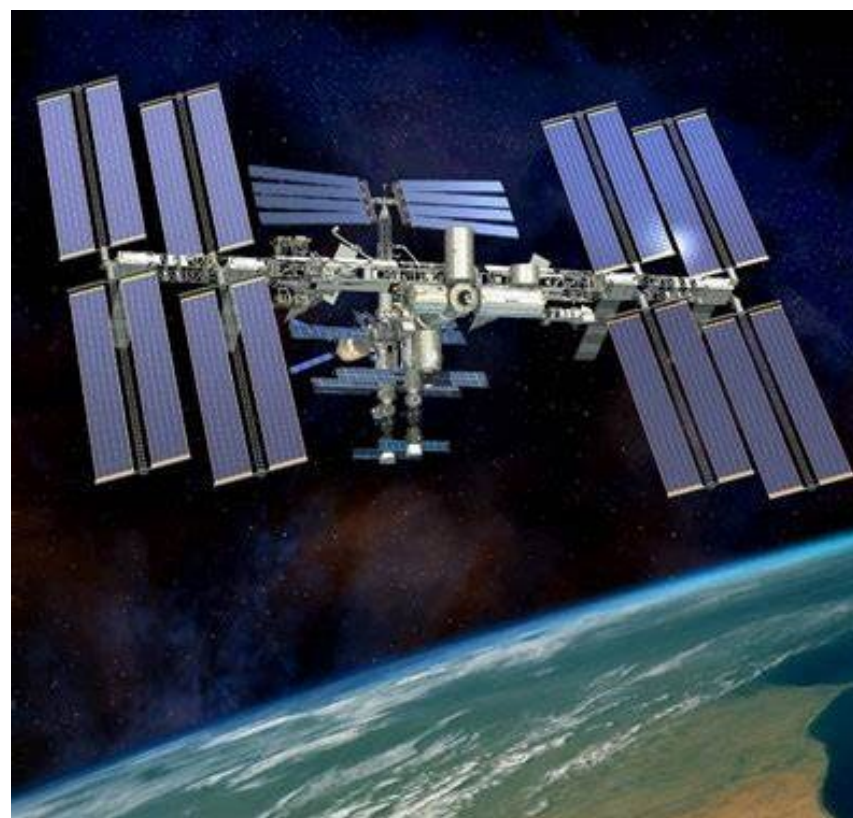


Atmosphere: ionosphere  
~60 – 1000 km

On Earth we are exposed to 2.4 mSv/yr.  
Note that 100 mSv/yr is the limit of acceptable risk.  
(40 times)



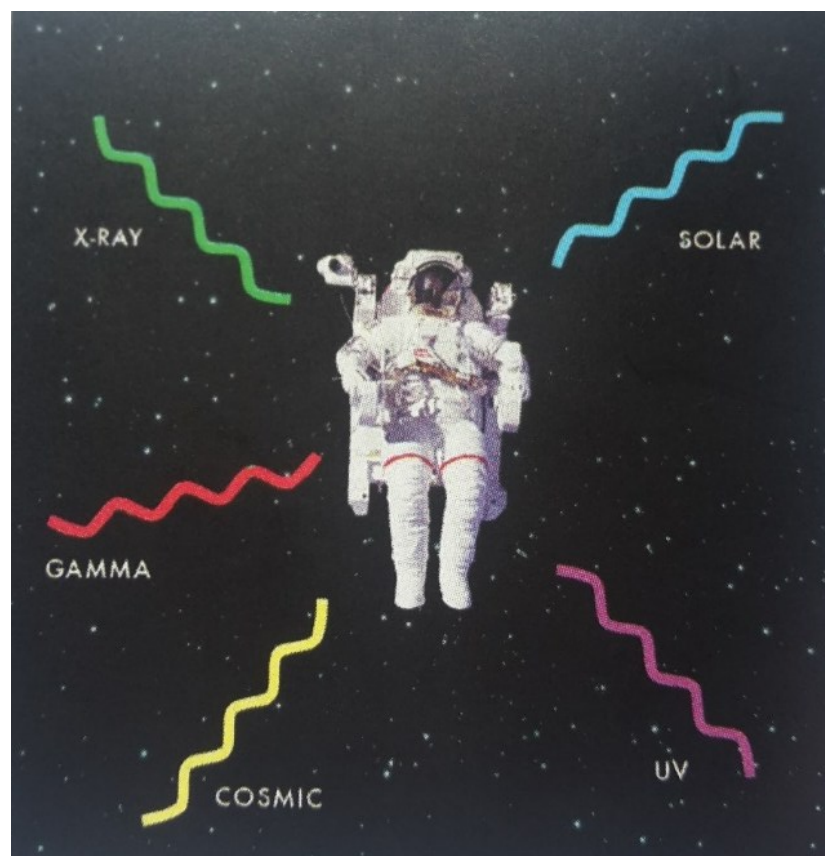
Earth  
2.4 mSv/yr  
(ground)



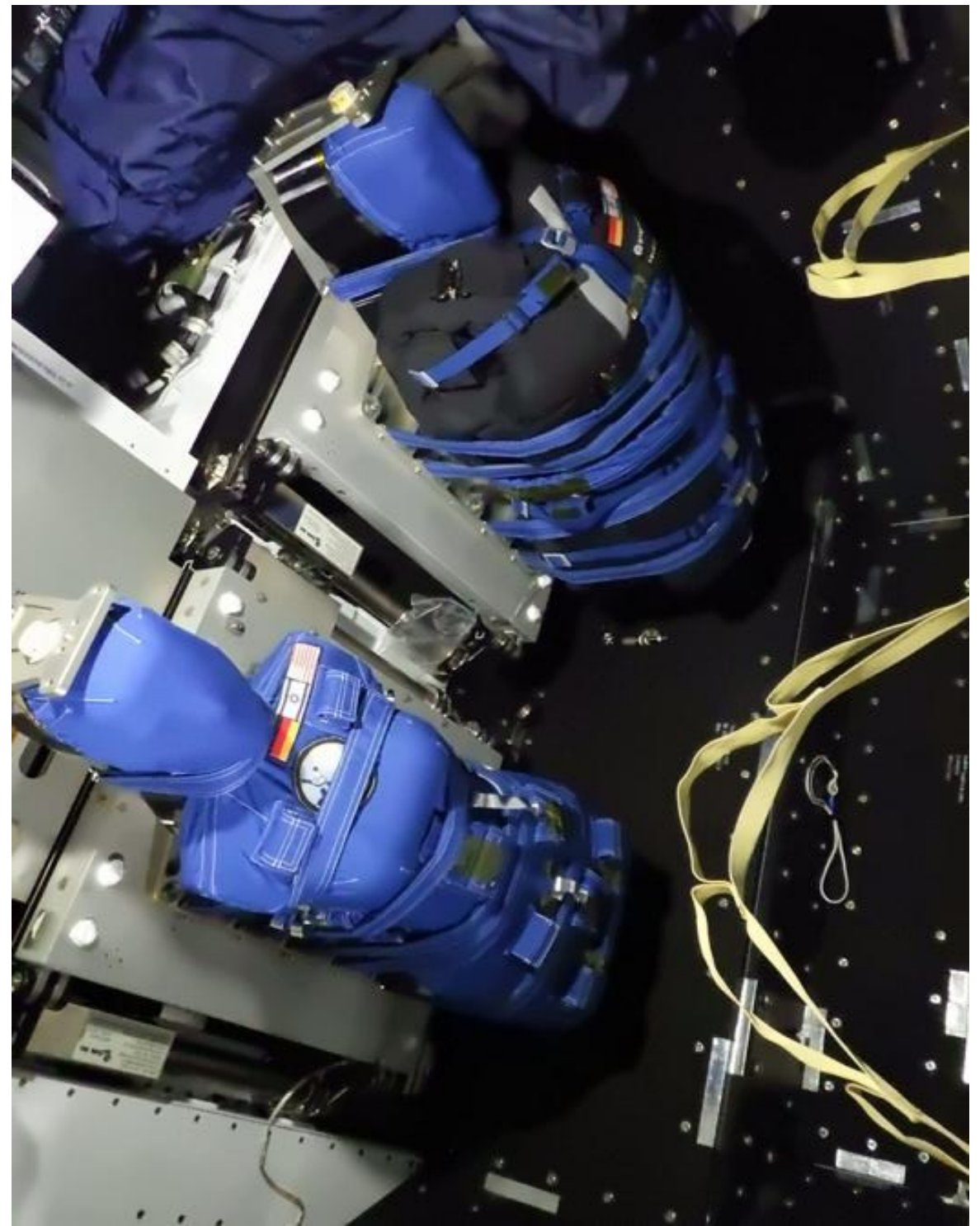
ISS  
150 mSv/yr  
60 times



Moon  
500 mSv/yr  
200 times



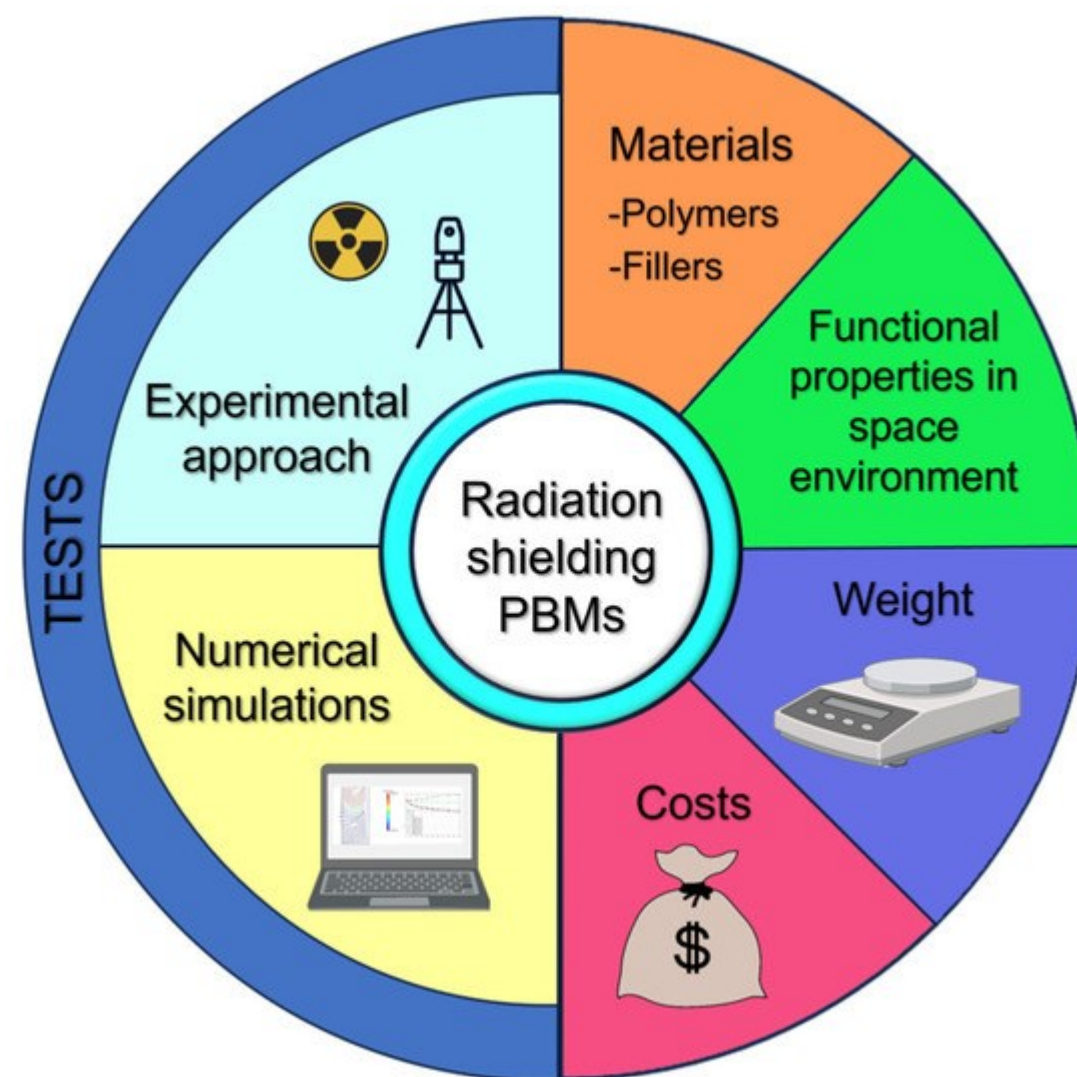
Mars and Space  
> 500 mSv/yr



ORION Spacecraft of ARTEMIS1: mannequins Helga e Zohar

To provide a picture of the radiation environment and realize adequate protecting spacesuits

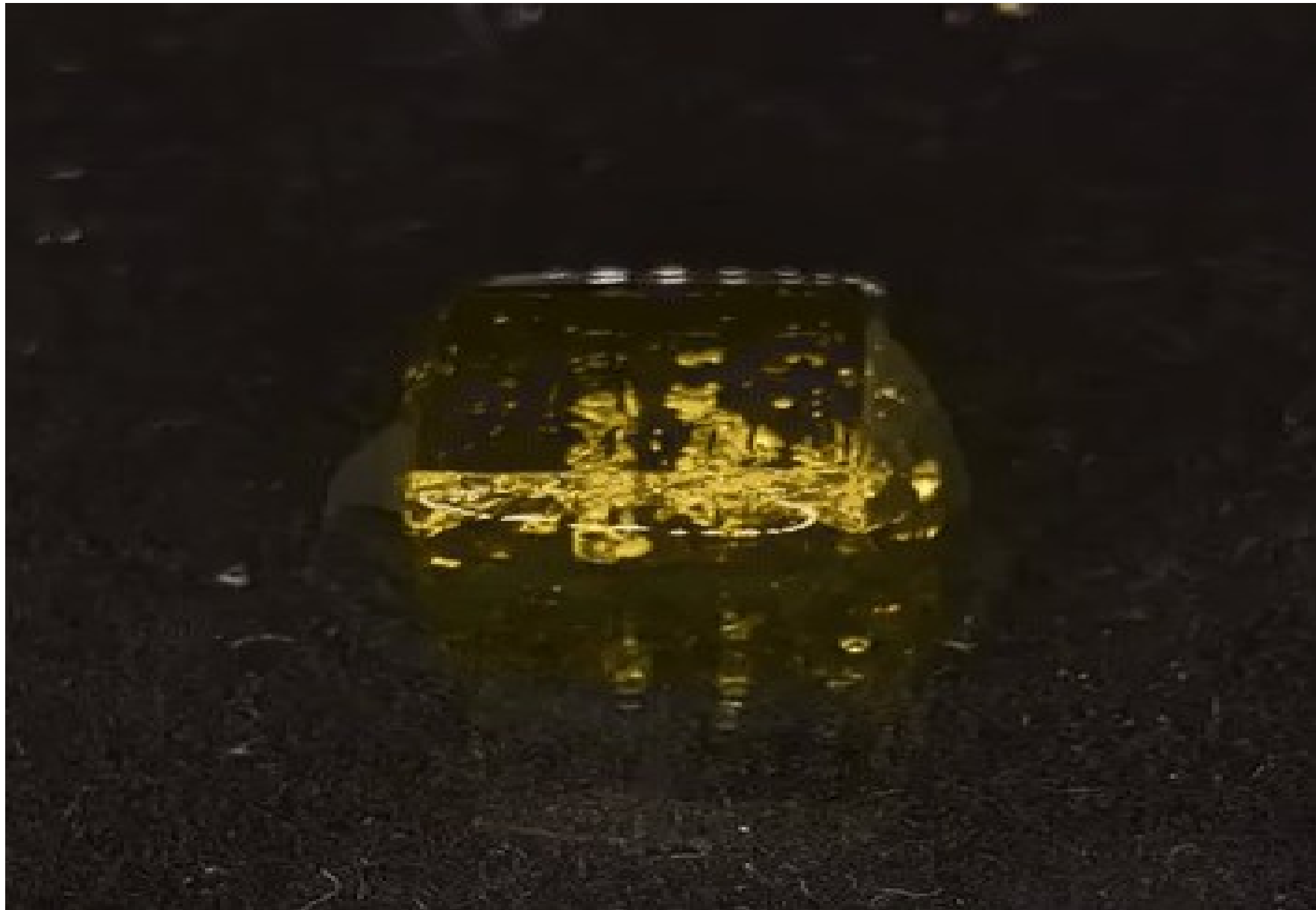
## High Fashion Meets Space Exploration



## Polymer-based materials

Toto, Lambertini, Laurenzi, Santonicola, *Polymer*, 2024, Università La Sapienza Roma

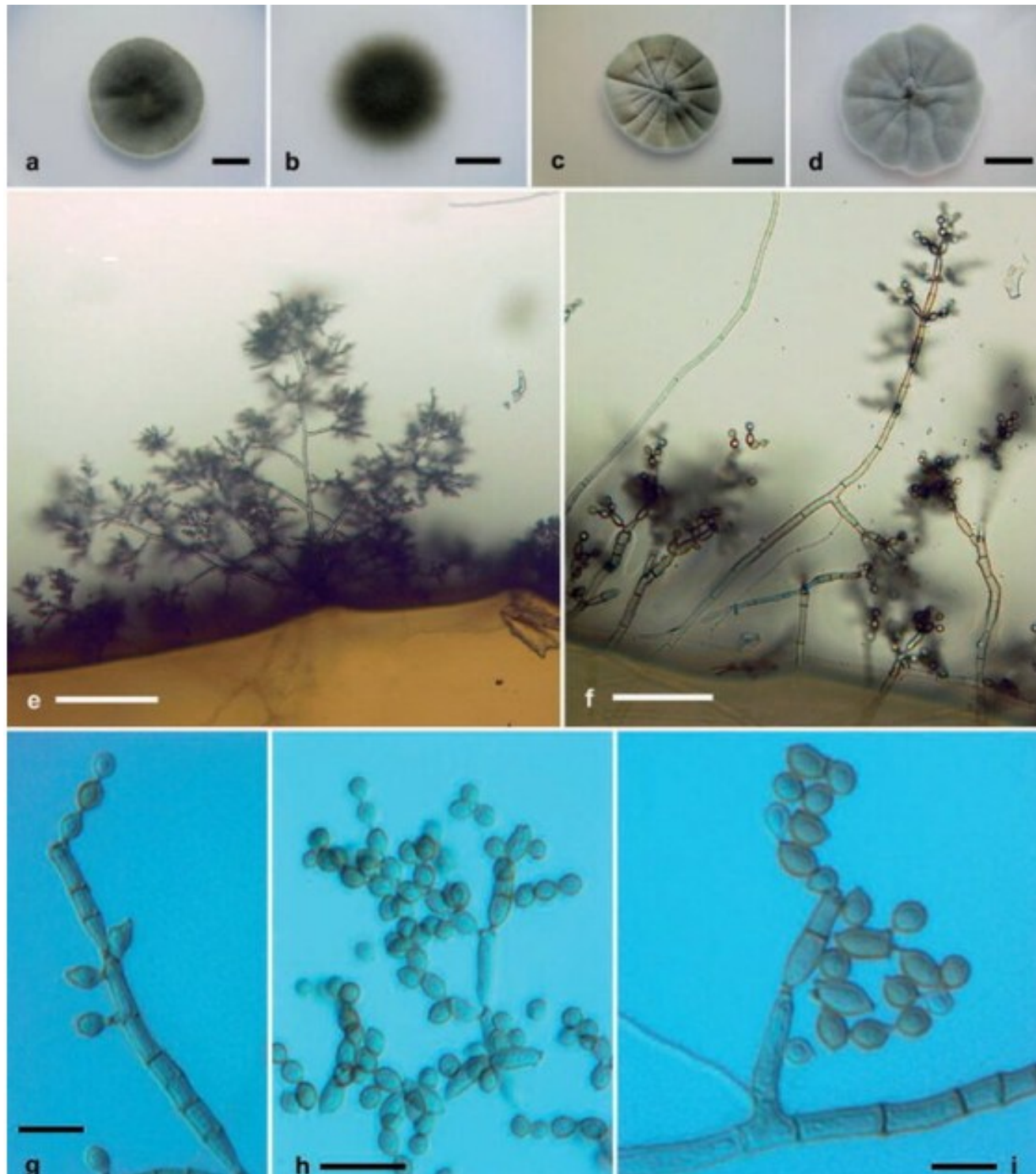
# Innovative technology: Hydrogels



Manon Minsart and Peter Dubruel, Polymer Chemistry and Biomaterials Group  
University of Ghent, Belgium

In collaboration with ESA

# Cladosporium sphaerospermum



## Figure

### Caption

*Cladosporium sphaerospermum*. Macro- and micromorphological characters. A-D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 °C in darkness. E-F. Habit of conidiophores. G-I. Ramoconidia and conidia. E-I. All from 7-d-old SNA slide cultures. A, C-D, F-H, from CBS ... [Read more](#)

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Zalar, de Hoog, Schroers, Crous, Groenewald, Gunde-Cimerman, 2007

Tested on ISS, Shunk, Gomez, Kern, Averagesch 2022, University of Mannheim

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Cerri M., Hitrec T., Luppi M., Amici  
NEUROSCIENCE AND BIOBEHAVIORAL REVIEWS, 2021

Cerri, M., NATURE AGING, 2025



THANKS