THE EXO-UV PROJECT

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THE EXO-UV project

To characterize the UV radiation environment of extrasolar planets orbiting habitable starts (F, G, K and M)

To study their influence on potential life on exoplanets

“Life as we know it”

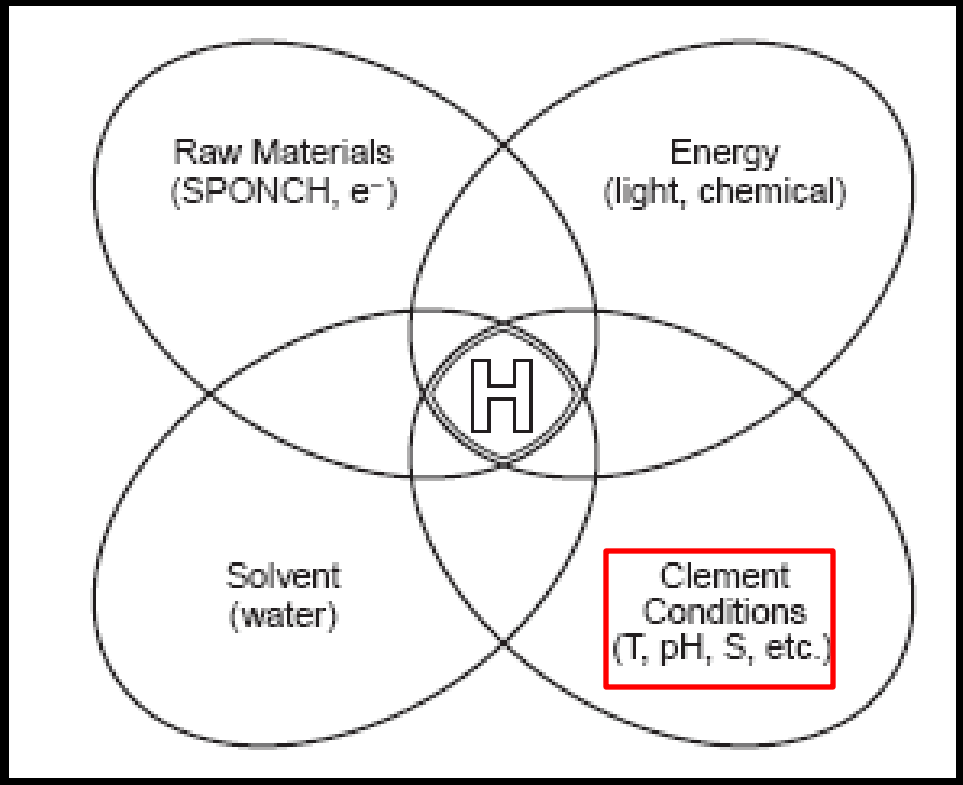
REQUIREMENTS FOR HABITABILITY:

-Presence of liquid water

-Proper conditions to build complex organic molecules

-External energy sources (light, chemical) to maintain metabolism

(**NASA astrobiology roadmap)**



HABITABILITY

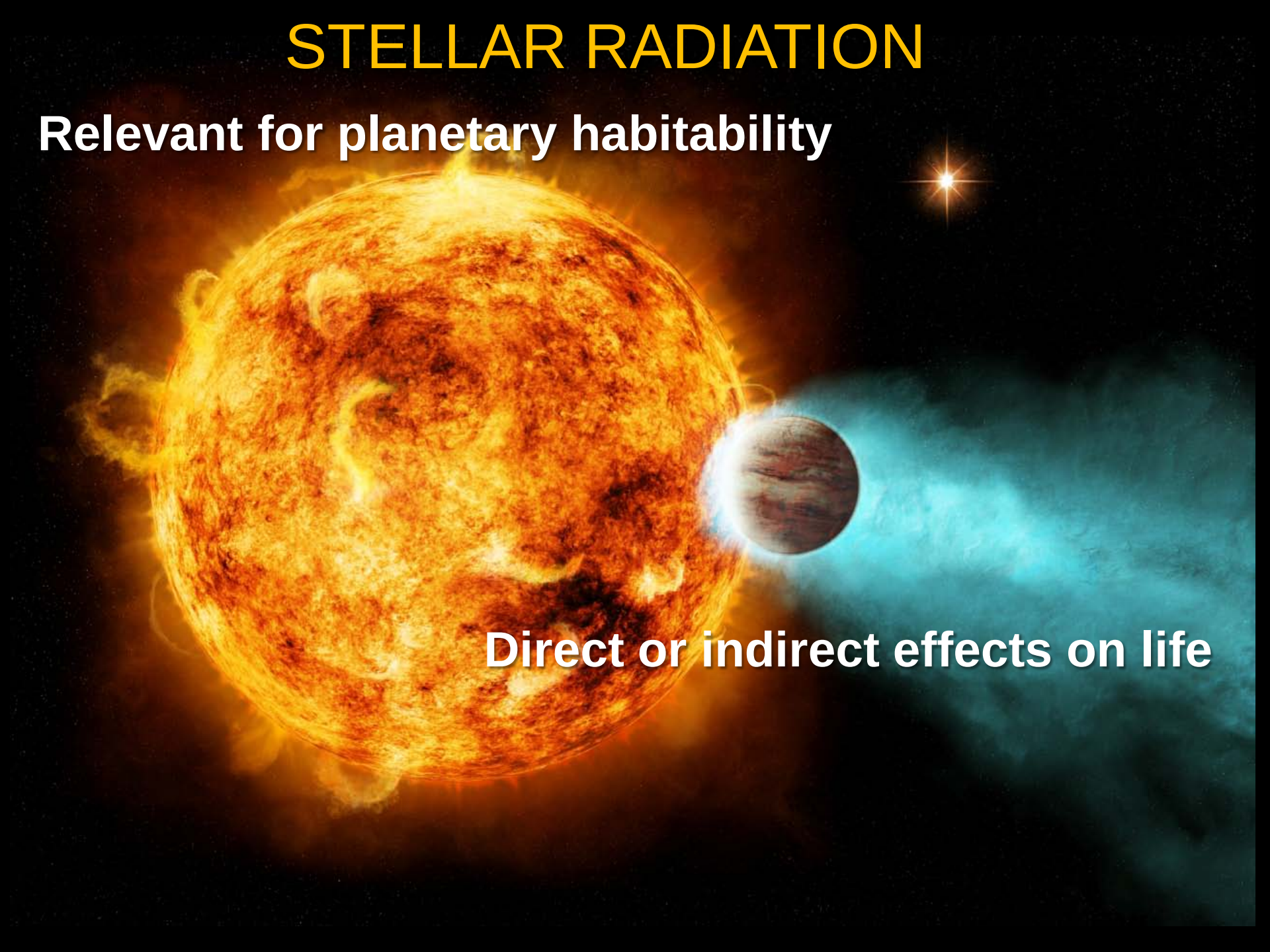
Not only important to consider “clement” conditions for life

But also to consider conditions that may be “unfavourable” for life

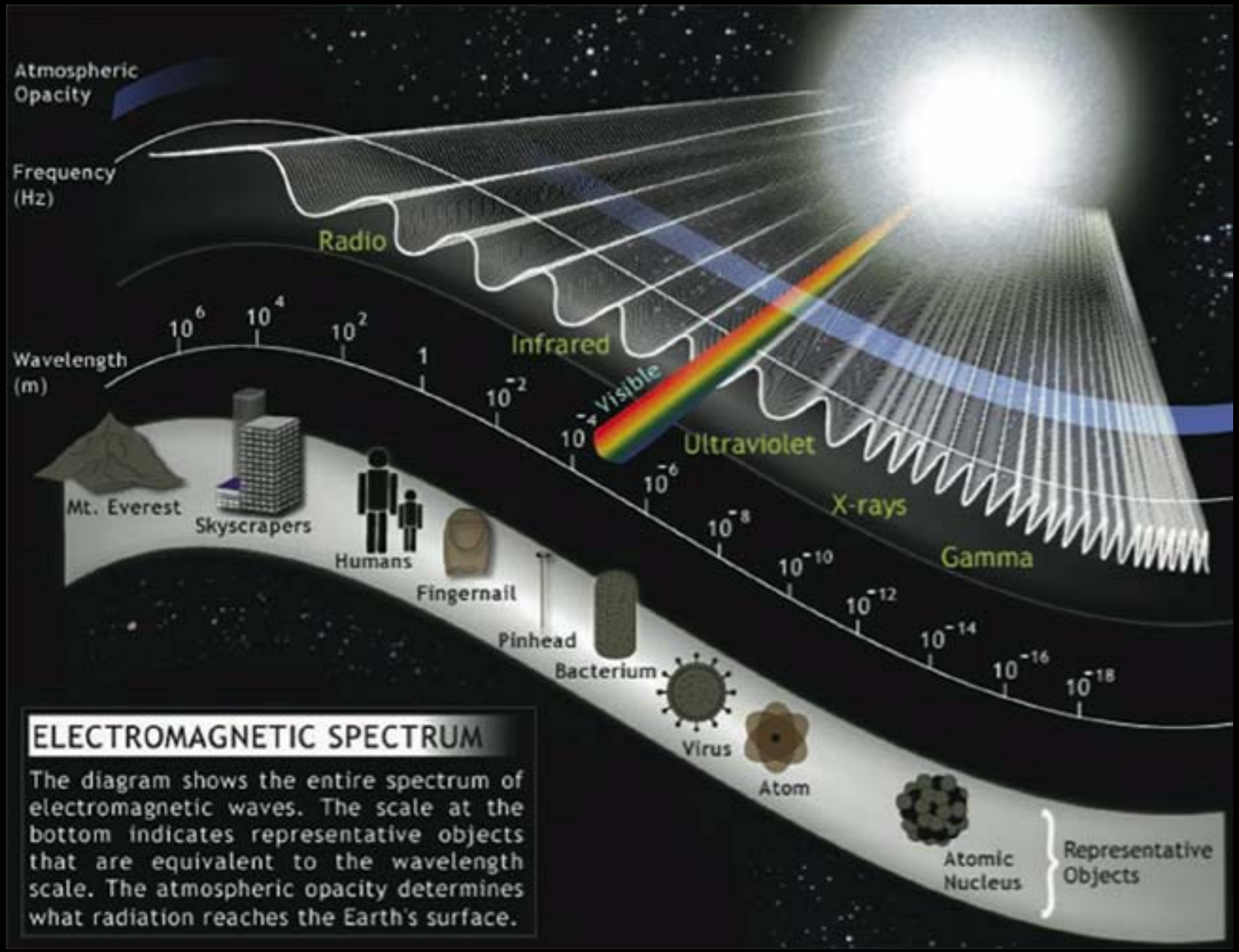
RADIATION

STELLAR RADIATION

Relevant for planetary habitability



Direct or indirect effects on life



ELECTROMAGNETIC SPECTRUM

The diagram shows the entire spectrum of electromagnetic waves. The scale at the bottom indicates representative objects that are equivalent to the wavelength scale. The atmospheric opacity determines what radiation reaches the Earth's surface.

THEREFORE UV RADIATION SHOULD BE CONSIDERED AS A PARAMETER TO DETERMINE THE HABITABLE ZONE

Previous works analyzing UV habitability are only based on **theorethical** modelling and only considered isolated **DNA molecules**

(Cockell, 2001; Buccino et al., 2007, etc)

NOT VERY REALISTIC?…

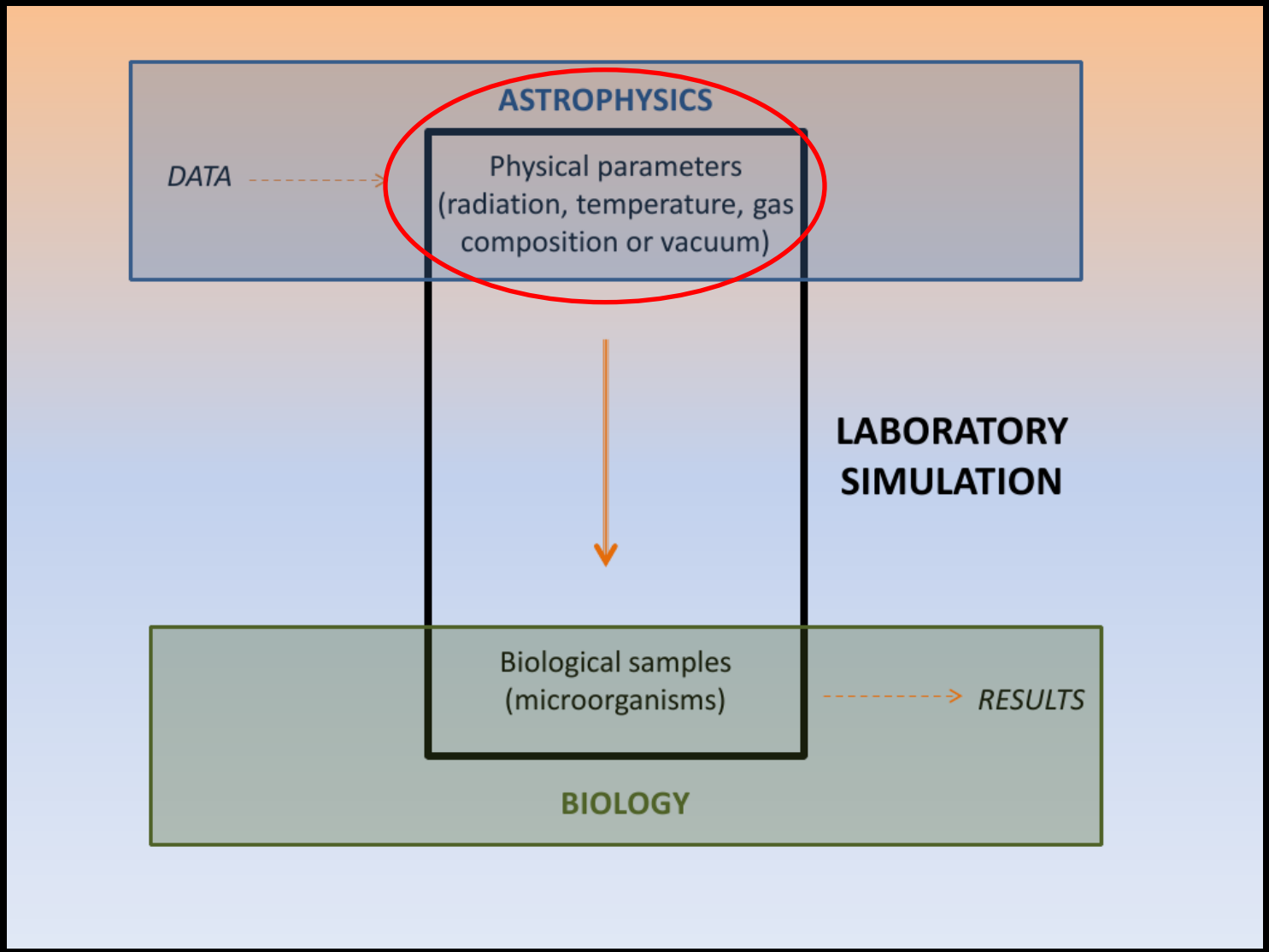
LIFE HAS DIFFERENT MECHANISMS TO COPE WITH RADIATION

¿HOW to perform these studies related to the interaction of radiation and life?

BIOLOGICAL EXPERIMENTS

Terrestrial microorganisms exposed to exotic conditions

ASTRO-BIOLOGICAL APPROACH



Abrevaya, BAAA(2014)

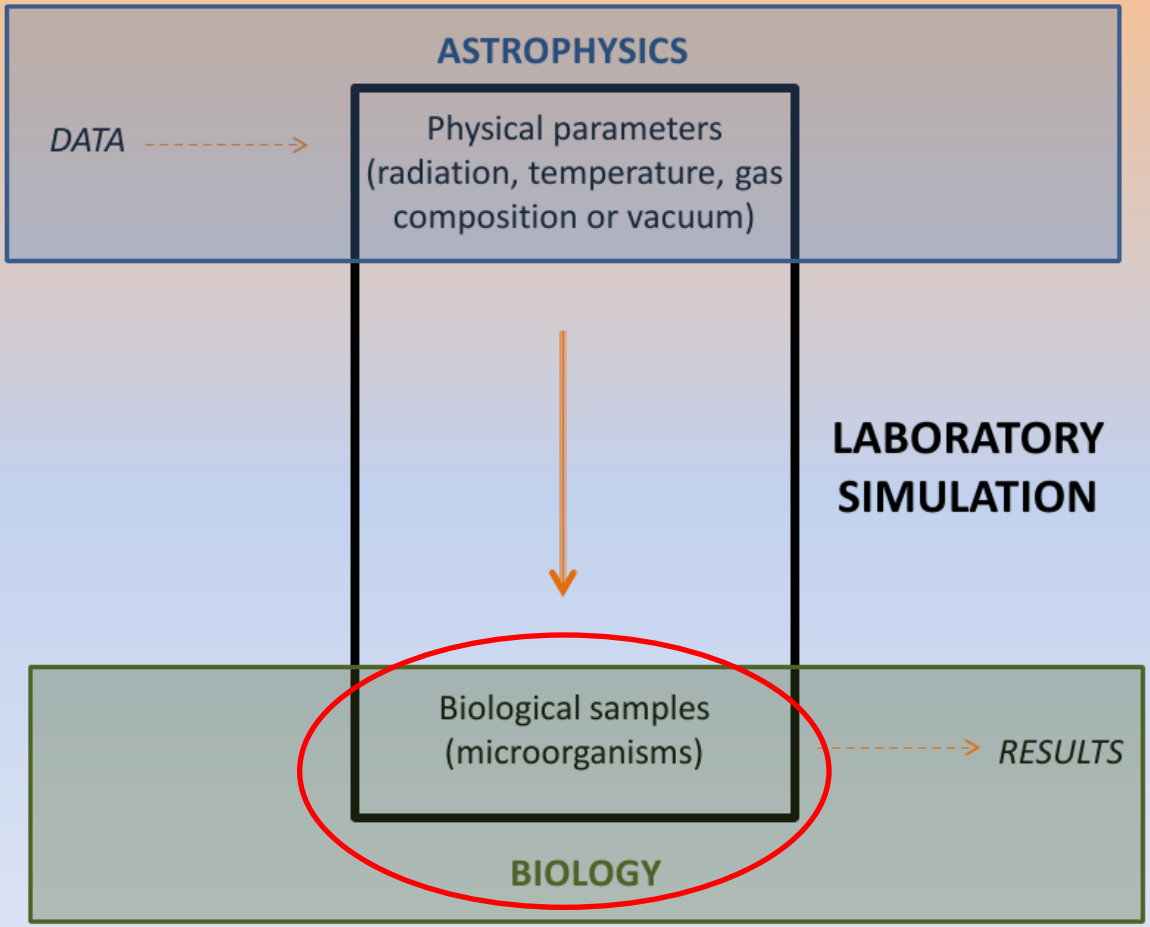
STEP 1: TO OBTAIN UV RADIATION FLUXES FOR F, G, K, AND M STARS

How many stars to consider?

AS MUCH STARS AS POSSIBLE…

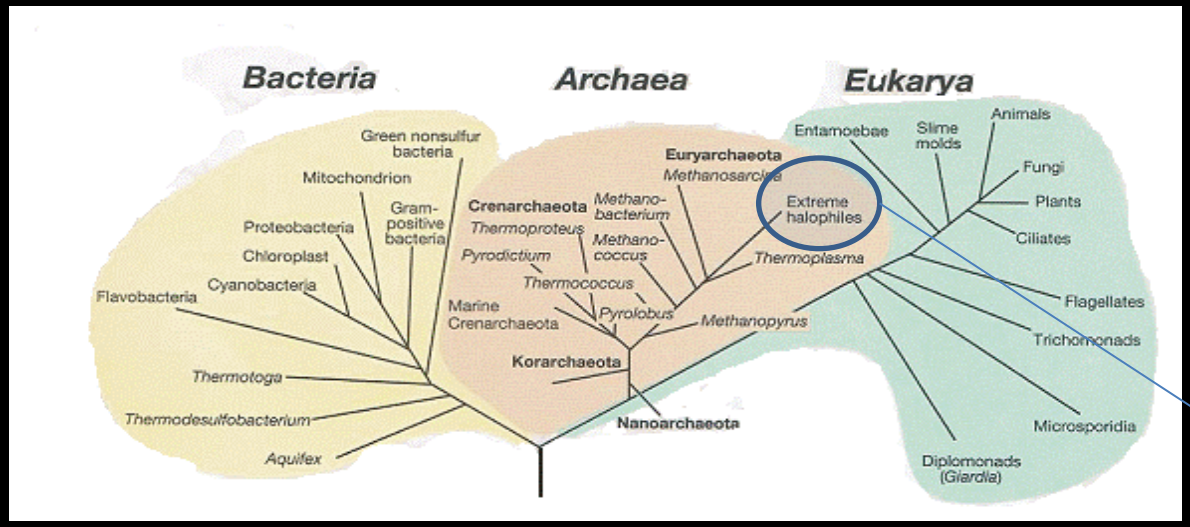
AUTOMATIZATION = SOFTWARE…

Nuñez Pölcher et al., 2015, in preparation

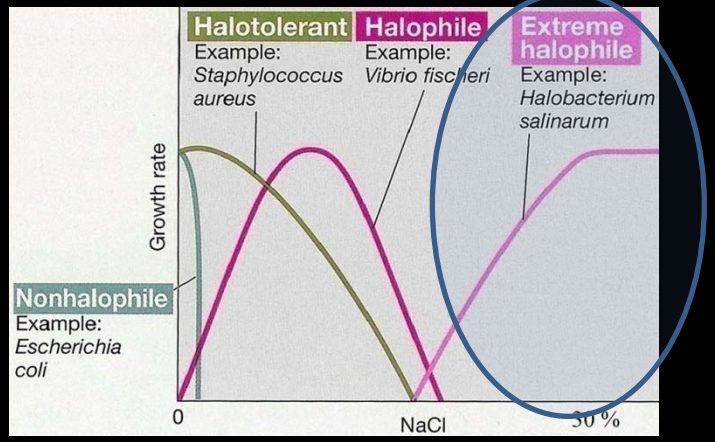


(Abrevaya X.C., 2014)

RADIATION RESISTANT MICROORGANISMS



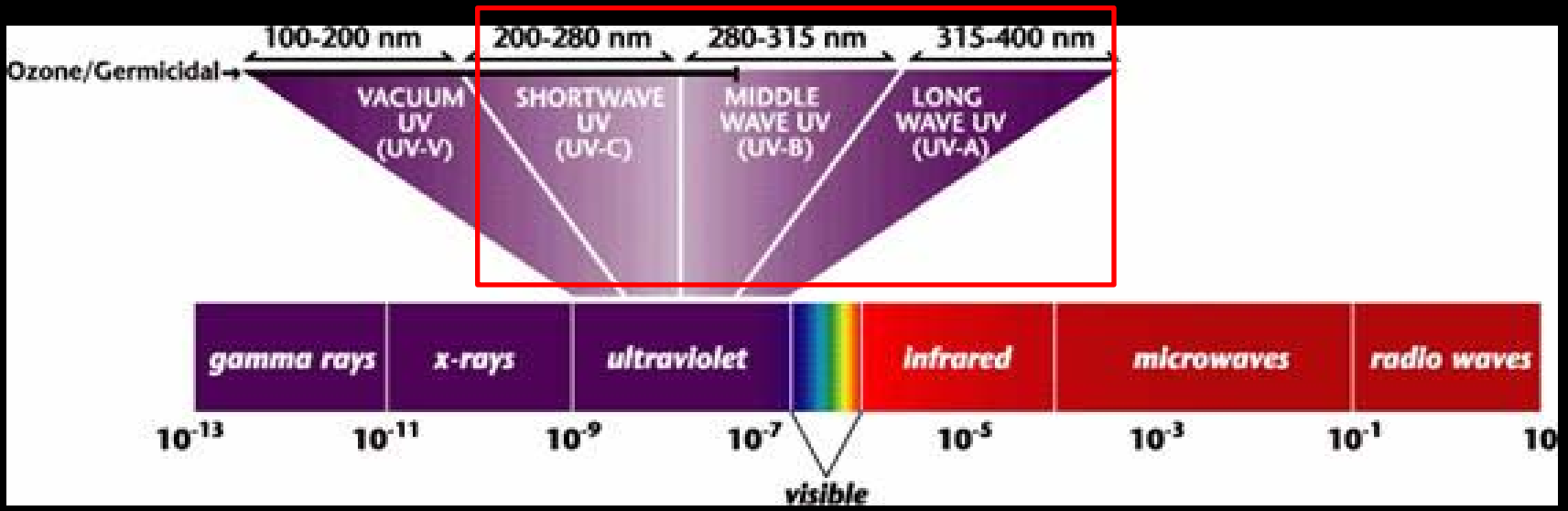
Optimum growth
2-5 M (NaCl)



HALOARCHAEA

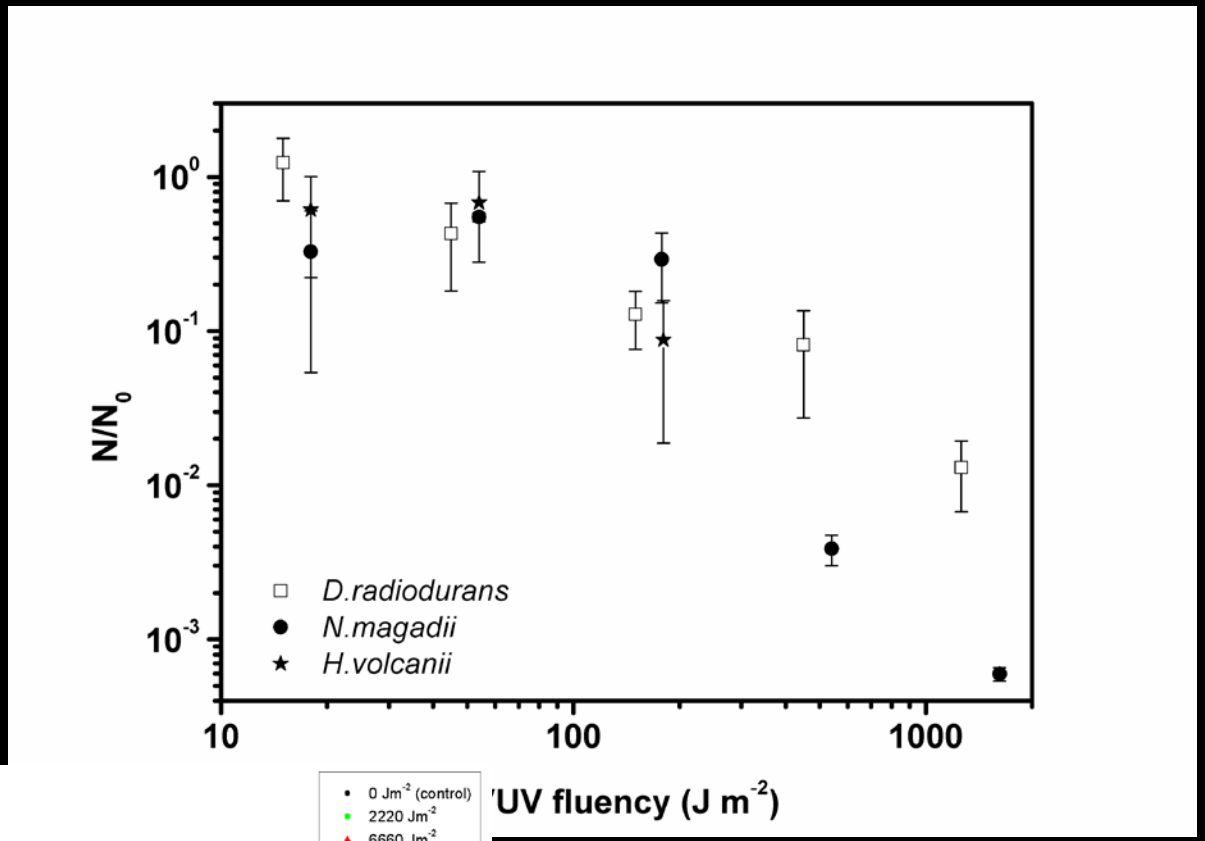
Models in Astrobiology
(radiotolerant, resistant to dessication, among other conditions)

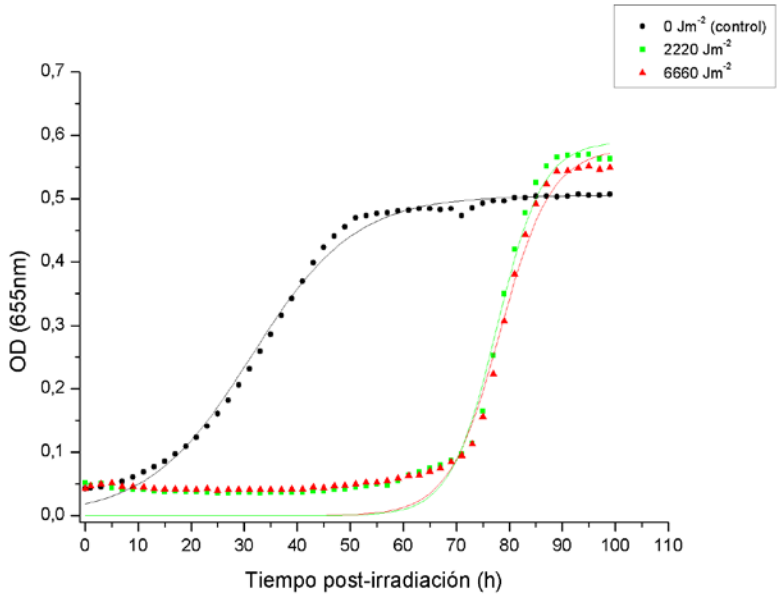
EXPERIMENTAL SIMULATIONS



SOLAR SIMULATOR
UV SPECTRUM (200-400 nm)

CELLS IN LIQUID CULTURES OR
DEPOSITED IN A INERT MATRIX





Survival with high UV-C doses

13,300 Jm^{-2}

Abrevaya et al., 2011

CONCLUSIONS

This project seeks to expand previous work, considering significant amount of data and laboratory simulations of these extraterrestrial environments.

This work could provide important data to perform other kind of experiments (e.g. prebiotic chemistry)

This could provide some important insights about planetary habitability, increasing our knowledge about the capability of life to survive in the context of exoplanets and stars of different spectral types.

Surprisingly this kind of experimental simulations sometimes reveals the capacity of microorganisms to live under conditions which do not belong to the environmental natural conditions in which microorganisms live.

This makes us to think in the possibility of “life as we know it” living in environments which are different from those found on the Earth

MERCI !

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