



# Status Report Astrobiology in Brazil

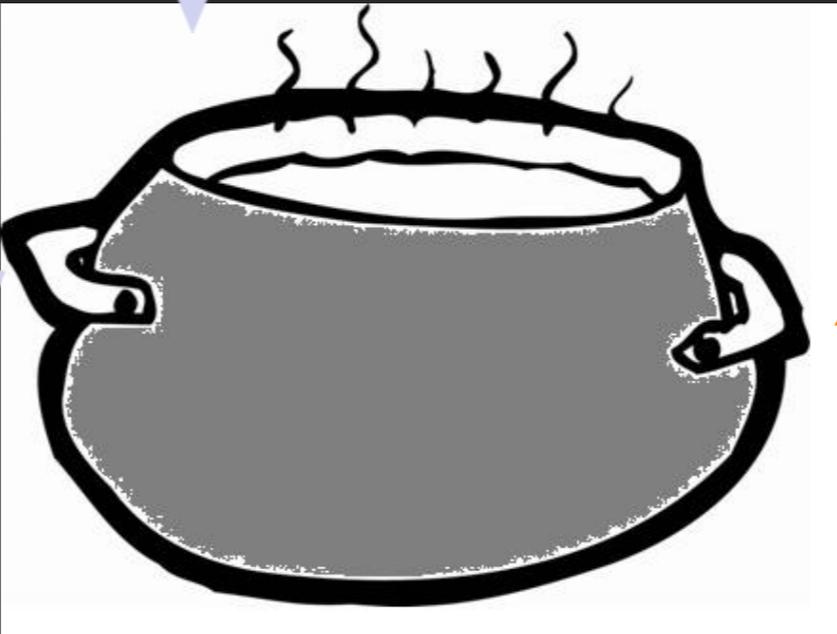
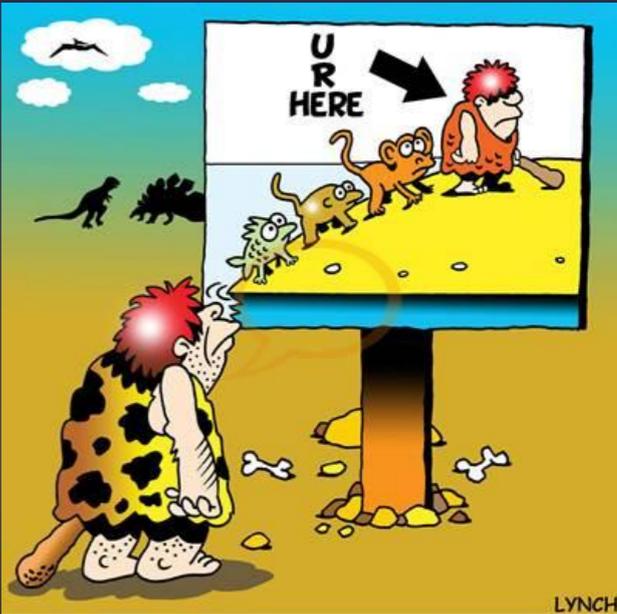
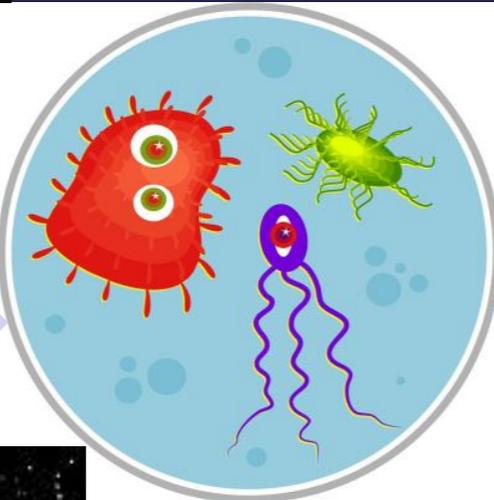
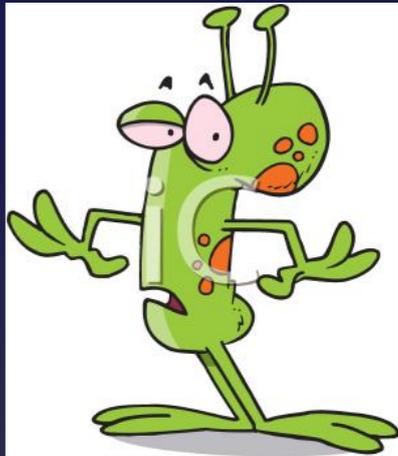
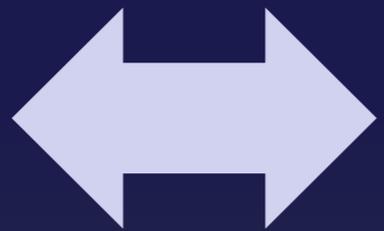
Jorge Horvath & Douglas Galante  
IAG/USP  
On behalf of the  
Brazilian Astrobiology Community

## ***II Brazilian Workshop on Astrobiology***

*(re)scheduled for Aug 13*

*(no centralized funding for Astrobiology)*

*Refine disciplinary focus, research interests  
show the scientific results and discuss national  
strategies*



**Making connections...**

**São Paulo  
Advanced School  
2013?**

**1<sup>st</sup> Planetary Camera to be installed in October !**

OAM  
AstroLab



UNICAMP

LNLS

Observatorio Abraão de Moraes

São Paulo

Sao Paulo  
city

Image ©2009 TerraMetrics  
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO

23°14'58.34" S 46°33'39.63" O

Altitude do ponto de visão 259.58 km

Google

## ***UHV***

**$10^{-11}$ mbar**

**Temperature (10 to 450K)**

**Radiation (UV, synchrotron, particles)**

## ***Low pressure***

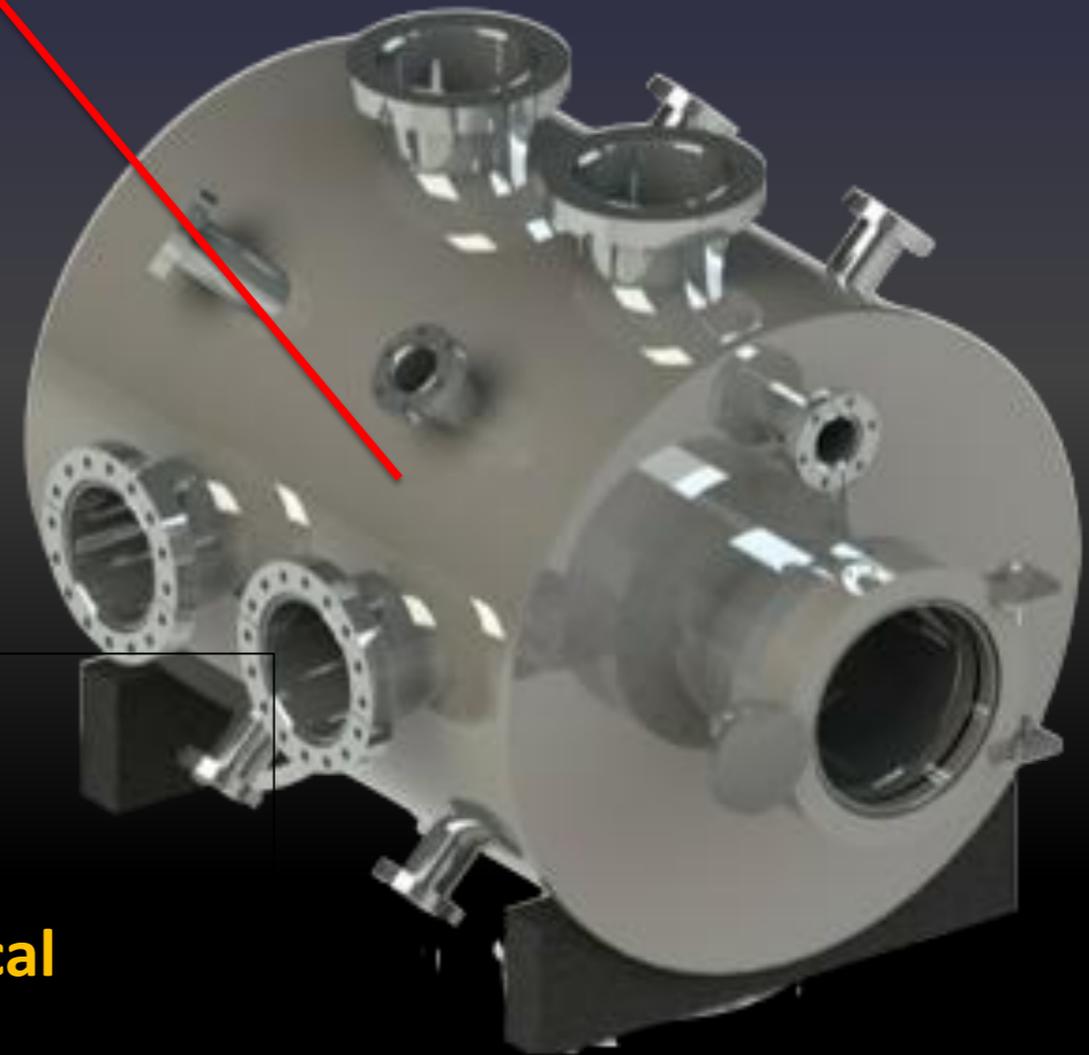
**$10^{-8}$ mbar – 10mbar**

**Gas mixtures**

**Temperature**

**Radiation**

***Detection / monitoring samples***  
***In situ*  $\mu$ Raman/UV-Vis**  
***In situ* QMS**  
**Conventional chemical and biological analysis**



# Ongoing theoretical work

Astrophysical Environments

Atmosphere

Biology

Geology

Work in progress using Non-equilibrium Thermodynamics and Kinetics to quantitatively justify Evolution (for model ecosystems)

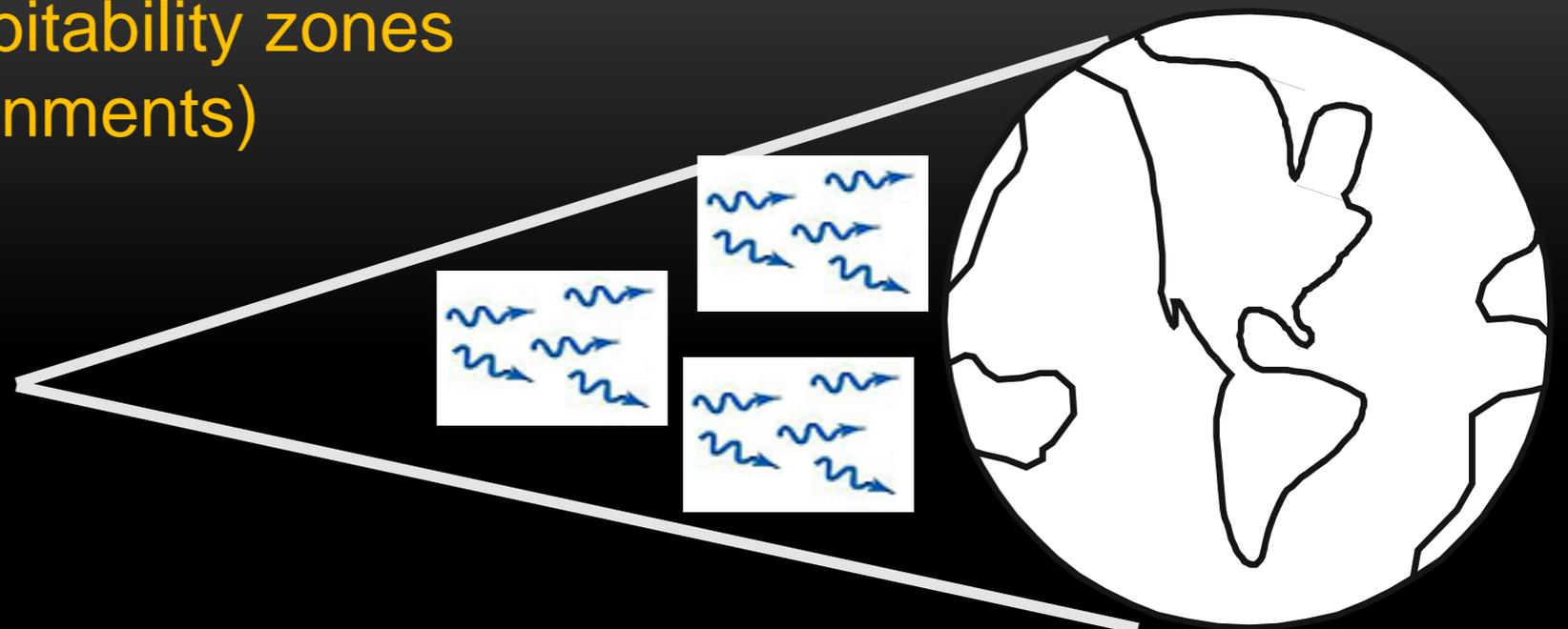
Work on the concept of habitability zones (radiation-rich environments)

Direct  $\gamma$

Irradiation UV

Flash O<sub>3</sub> Layer Depletion

Cosmic Ray Jets



# Ongoing lab work sponsored by NAP



**Pre-Cambrian microfossils (Fairchild/Leme @ IO/USP) → Mars connection**

**Mars Science Laboratory (Renno@ Michigan) → student exchange**

# Partnership with NAI

Foster the creation of material in Portuguese and Spanish, as well as undergraduate and graduate courses in astrobiology;

Requested ~U\$ 45 000 for the production of educational/outreach material

## Planet Quest: A Historic Timeline of the Search for Other Worlds



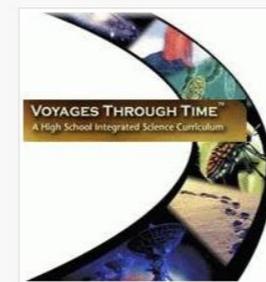
NASA's Planet Quest website presents a Historic Timeline of the search for other worlds. The Timeline is a continuously updated Flash interactive that records 2,000 years of milestones in the search for exoplanets, done in a rich visual style. It serves as a primary source for members of the general public looking for information on the history of exoplanets, as well as for teachers in classrooms, educators in museums and science centers, and even...

## Virtual Field Trip to Western Australia



Within the virtual field trip application, users are taken from a global view directly down to a surface view of a site. They are then seamlessly placed into a 360 degree spherical virtual reality surface panorama of that location. Next users navigate around the site selecting various objects and scientists to learn more about how and why this site was chosen,...

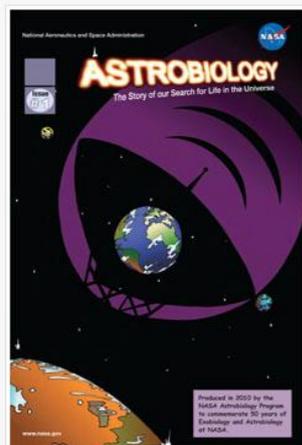
## Voyages Through Time



Voyages Through Time (VTT) is an integrated science curriculum for ninth or tenth grade based on the theme of evolution and delivered on CD-ROM. It's six modules span the breadth of astrobiology research, from cosmic evolution through the evolution of life, and beyond. In VTT, evolution is defined as cumulative change over time that occurs in all realms of the natural world. The evolutionary scope of VTT is billions...



## Astrobiology Graphic Novel



The first issue of the Astrobiology Graphic Novel is now available! Download the pdf or the mobile app! Through fantastic original artwork and a compelling storyline, the novel chronicles the origin and evolution of astrobiology itself – tracing its roots from early cave paintings, through speculations of ancient Greek philosophers on the existence of other worlds, to contributions from more modern scientists such as Huygens, Galileo, Oparin, Haldane, Miller, Urey, Franklin, Watson, Crick, and...

Challenges related to the diversity and cultural differences

- 1) Joint evaluation
- 2) Refined study of the chosen material
- 3) Production of web+print
- 4) **Assesment** of the results with public/schools

# Brazilian Network of Astrobiology: a virtual organization under study



7 Brazilian States  
11 coll. countries

- |           |          |
|-----------|----------|
| Argentina | Portugal |
| Chile     | Russia   |
| Colombia  | Spain    |
| Cuba      | UK       |
| Germany   | USA      |
| Mexico    |          |

# **Institutional collaborations under study:**

**Nordic Network of Astrobiology  
Canadian Astrobiology Network (CAN)**

## **Participation in Schools sponsored by NAP**

Santander Summer School of Astrobiology 2012 (Santander, Spain)

\* Luiz Felipe de Almeida Benites (UNISINOS)

•Alexey Magnavita (IAG-USP)

Astrobiology Graduate Conference 2012 (AbGradCon 2012)

\* André Pulschen (AstroLab e UFSCar)

\* Felipe Nóbrega (AstroLab e IO-USP)

Thank you Carl !

[foton@astro.iag.usp.br](mailto:foton@astro.iag.usp.br)

[douglas@astro.iag.usp.br](mailto:douglas@astro.iag.usp.br)

[www.astrobiobrasil.org](http://www.astrobiobrasil.org)