# Material orgânico em meteoritos

Conteúdo de carbono: > 3% (por peso); fração solúvel < 30% do total de carbono

COMPONENTES

**Ácidos**

Aminoácidos

Ácidos carboxílicos

Ácidos hidrocarboxílicos

Ácidos dicarboxílicos

Ácidos hidroxidicarboxílicos

Ácidos sulfônicos

Ácidos fosfônicos

**Outros**

N-Heterocíclicos

Amidas

Aminas

Álcoois

Compostos carbonílicos

**Fulerenos**

$C_{60}$, $C_{70}$,

He em $C_{60}$

Fulerenos mais complexos

**H-carbonetos não voláteis:**

Alifáticos

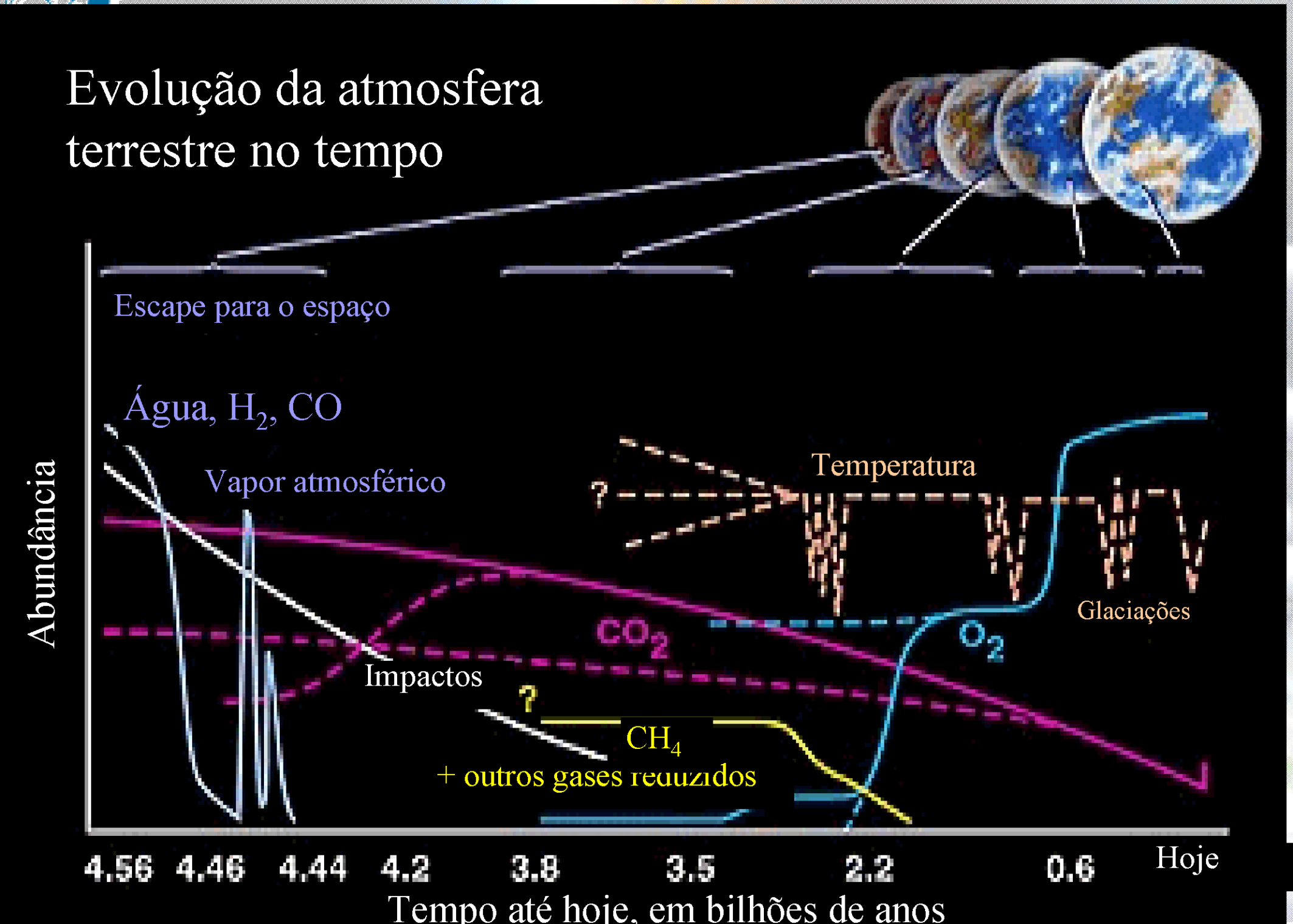
aromáticos (PAH)

polares

**H-carbonetos voláteis**

Chanrley, EAA lectures (2004)

# Evolução da atmosfera terrestre no tempo



# Condições de habitabilidade
## (a NOSSA receita)

1. $H_2O$ superficial por, pelo menos, um bilhão de anos
2. Intenso bombardeamento por cometas e meteoritos há ~ $7x10^8$ anos
3. Intensa atividade geológica
4. Existência de campo magnético
5. Atmosfera contendo $CO_2$-$H_2O$-$N_2$
6. Estabilidade climática
7. Resistência a catástrofes por ~ 1 bilhão de anos
8. Primeiras evidências de vida: ~ 3,6 bilhões de anos

# A Terra vista de longe...

Arnold. L. Astro-ph/0706.3798v2

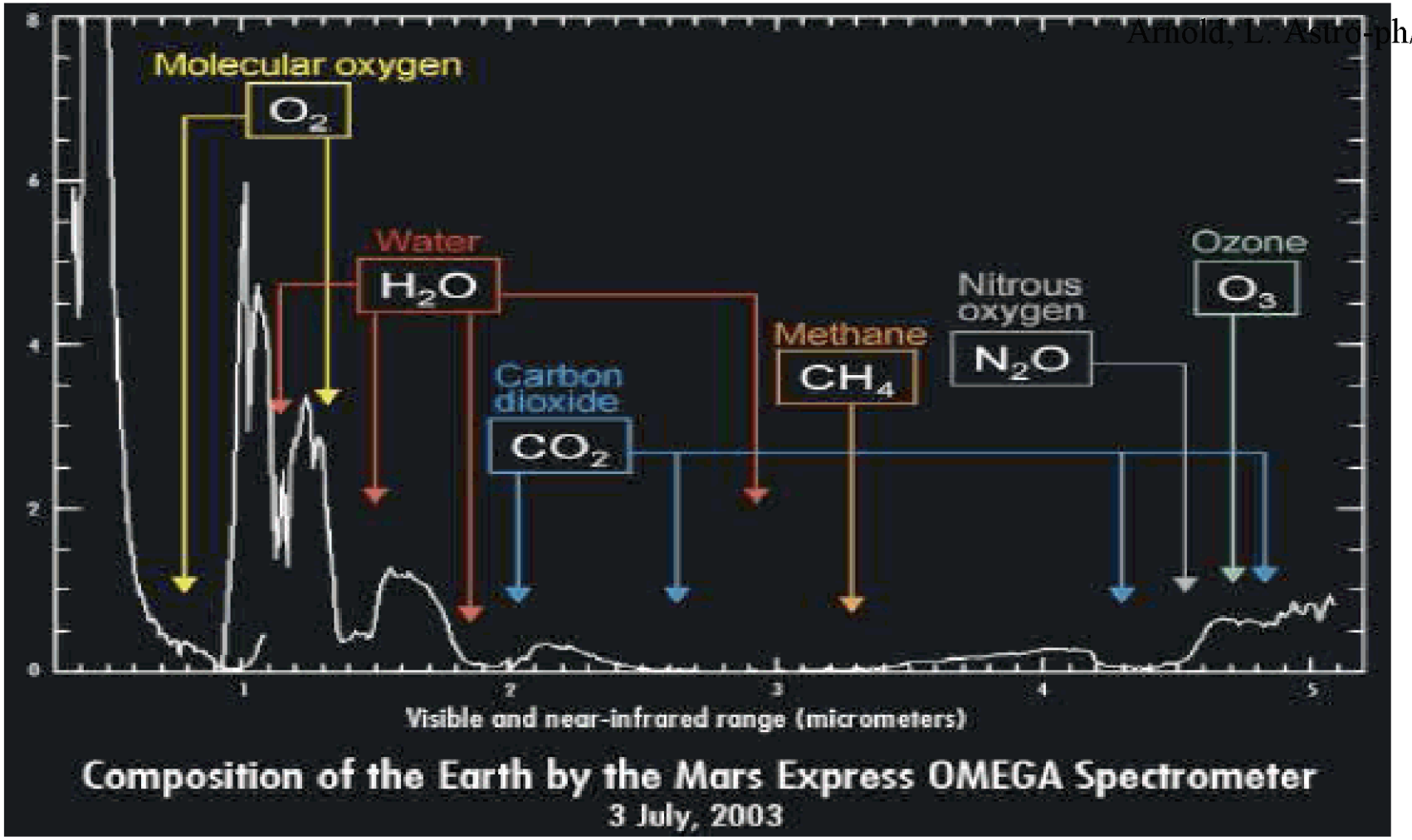
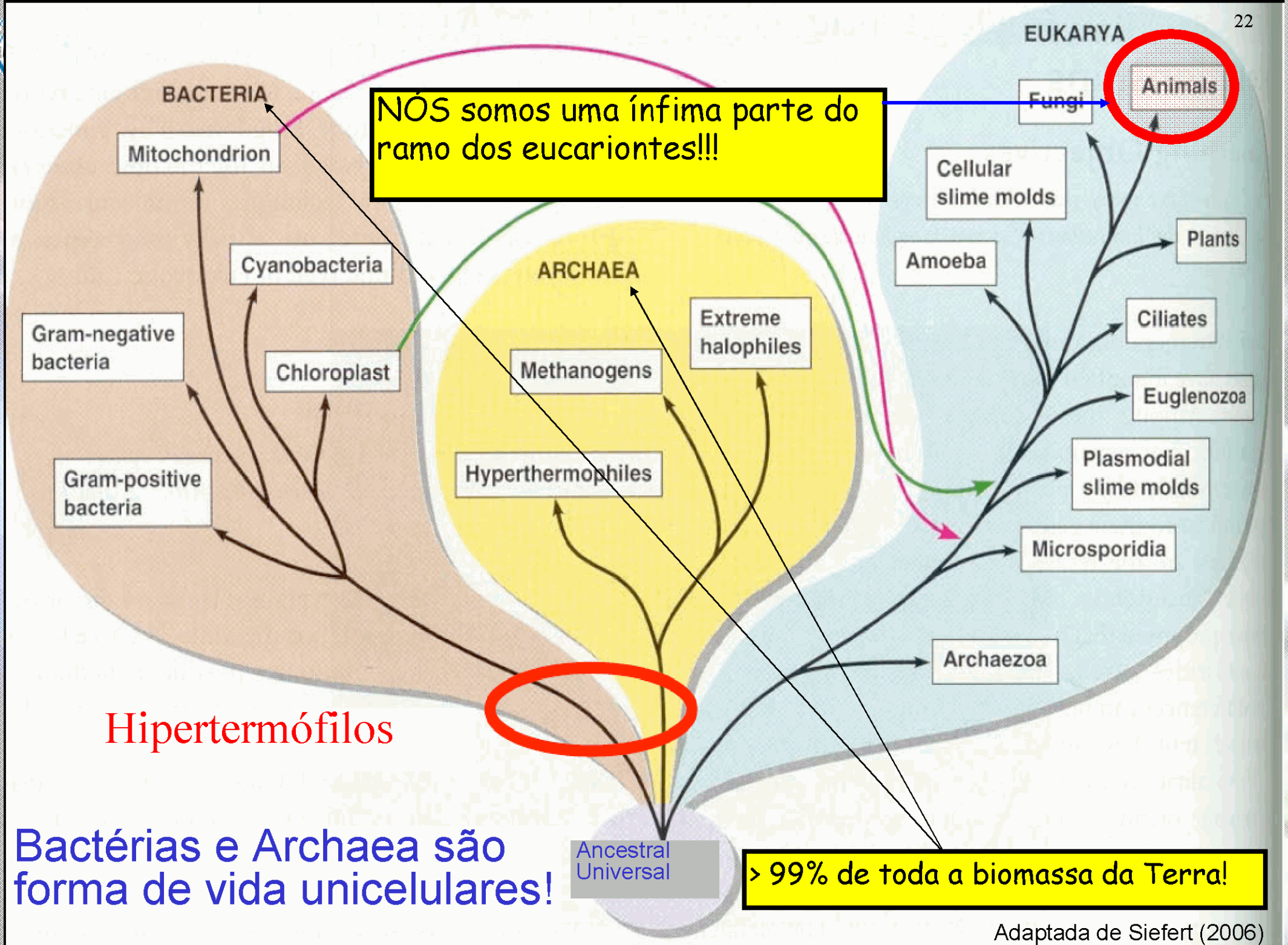
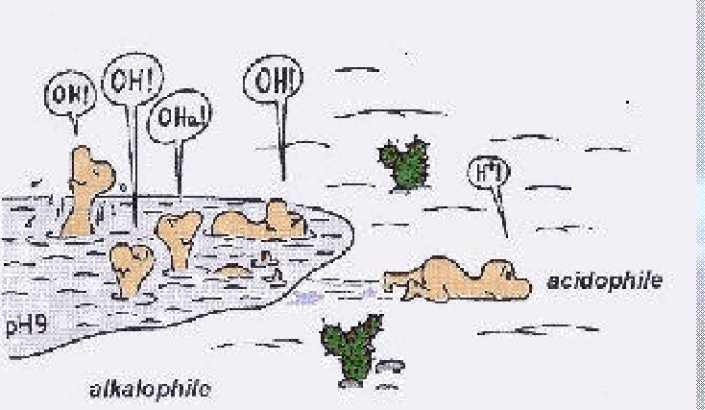



**Fig. 2** Mars Express recorded the Earth spectrum with its OMEGA instrument in July 2003 while it was traveling to Mars. This picture illustrates how could look like an Earth-like extrasolar planet spectrum recorded with a high signal to noise ratio (figure adapted from http://mars.jpl.nasa.gov/express/newsroom/pressreleases/20030717a.html).

# Extremófilos e o aparecimento da vida

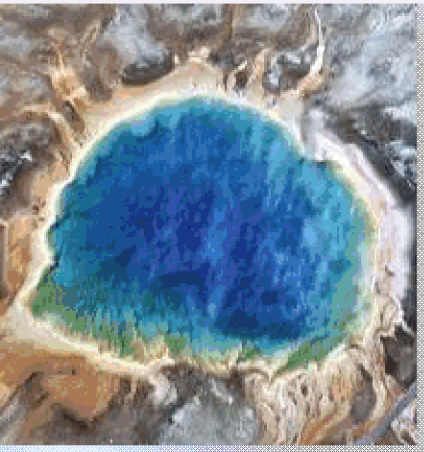


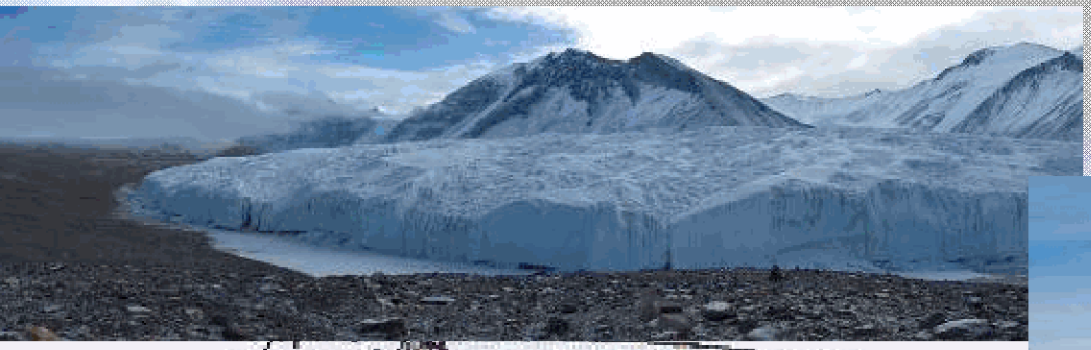

Adaptada de Siefert (2006)

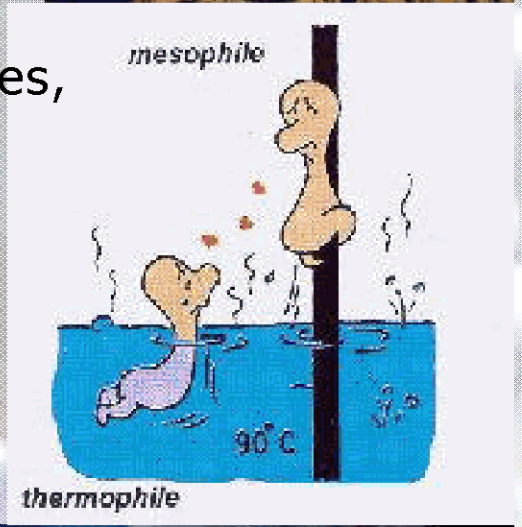




- Temperatura: -15° C < T < 121° C
- 0,06 < pH < 12,8
- 0 < Pressão < 1200 atm
- Metabolismo não necessariamente baseado em Oxigênio
- 20-40 milhões de anos de dormência
- 2 ½ anos no espaço, a -250 C, sem nutrientes, água e expostos à radiação (Strep. Mitis)









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ARTICLES

# Major viral impact on the functioning of benthic deep-sea ecosystems

Roberto Danovaro[1], Antonio Dell'Anno[1], Cinzia Corinaldesi[1], Mirko Magagnini[1], Rachel Noble[2], Christian Tamburini[3] & Markus Weinbauer[4]

Viruses are the most abundant biological organisms of the world's oceans. Viral infections are a substantial source of mortality in a range of organisms—including autotrophic and heterotrophic plankton—but their impact on the deep ocean and benthic biosphere is completely unknown. Here we report that viral production in deep-sea benthic ecosystems worldwide is extremely high, and that viral infections are responsible for the abatement of 80% of prokaryotic heterotrophic production. Virus-induced prokaryotic mortality increases with increasing water depth, and beneath a depth of 1,000 m nearly all of the prokaryotic heterotrophic production is transformed into organic detritus. The viral shunt, releasing on a global scale ~0.37–0.63 gigatonnes of carbon per year, is an essential source of labile organic detritus in the deep-sea ecosystems. This process sustains a high prokaryotic biomass and provides an important contribution to prokaryotic metabolism, allowing the system to cope with the severe organic resource limitation of deep-sea ecosystems. Our results indicate that viruses have an important role in global biogeochemical cycles, in deep-sea metabolism and the overall functioning of the largest ecosystem of our biosphere.