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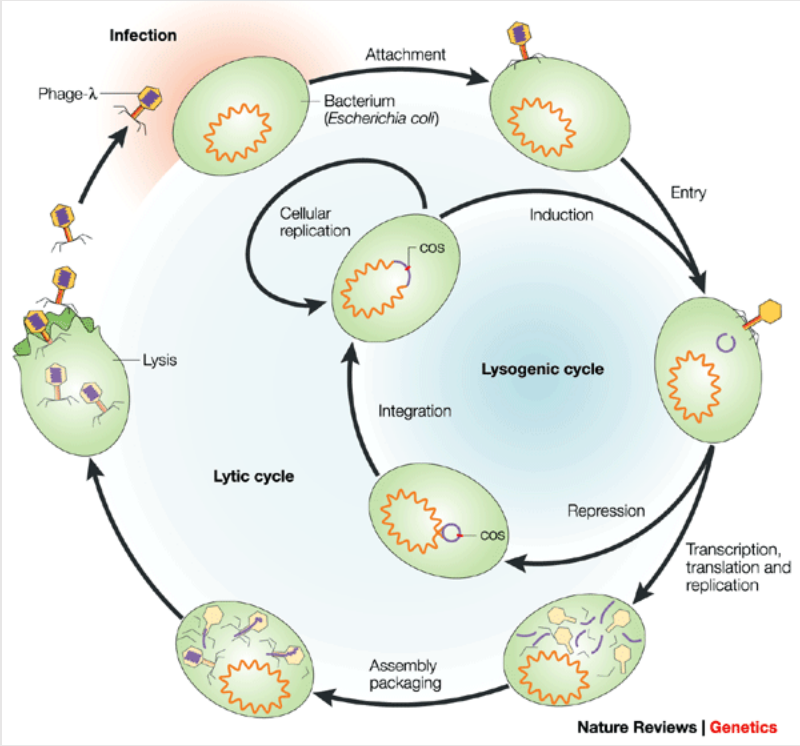
Understanding the role, impact, and importance of virus-host interactions in aquatic environments

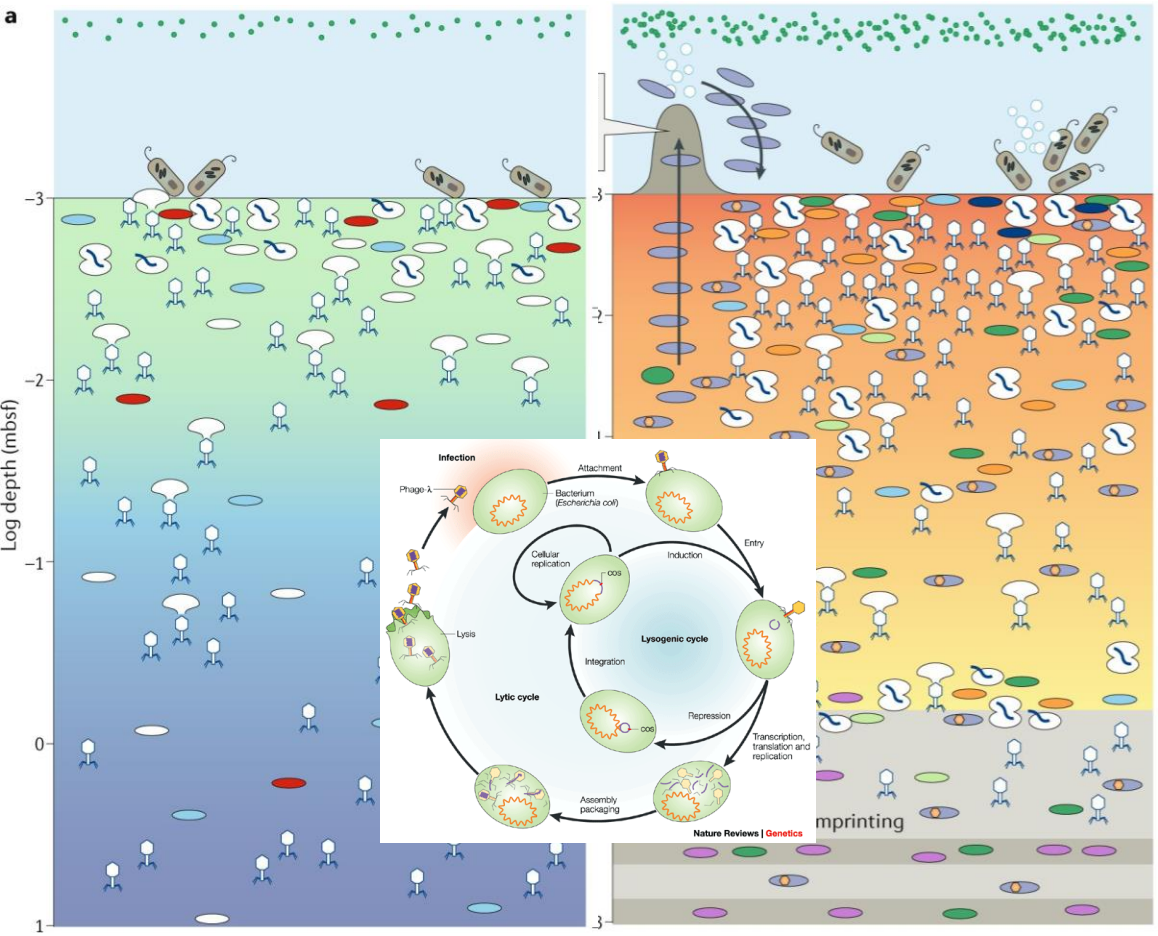
- **Viruses in sediment:**
  - 10-100X more abundant than their microbial hosts
    (Kallmeyer et al., 2012*; Engelhardt et al., 2014*)
  - More abundant when total organic carbon is in higher concentrations
    (Cai et al., 2018*)
  - Display great genomic diversity
    (Yoshida et al., 2018a,b, Yoshida et al., 2013)
  - Are active at depth
    (Cai et al., 2018*)
- **Viruses in basement:**
  - ?

Virus life cycles



Campbell, *Nature Reviews Genetics*, 2003

Viruses in sediment may be major players in the geochemical cycles



Orsi, *Nature Reviews Microbiology*, 2018

- What drives infection rate in sediment?
  - What is the infection rate in sediment?
  - What is the preferred life style of viruses?
- What is the role of viruses in sediment?
  - How much organic matter is made available by viral infections?
  - What is the contribution of viruses to microbial metabolisms?
- What are virus-host dynamics?
  - Who are viruses infecting?
  - How are viruses involved in microbial adaptation?

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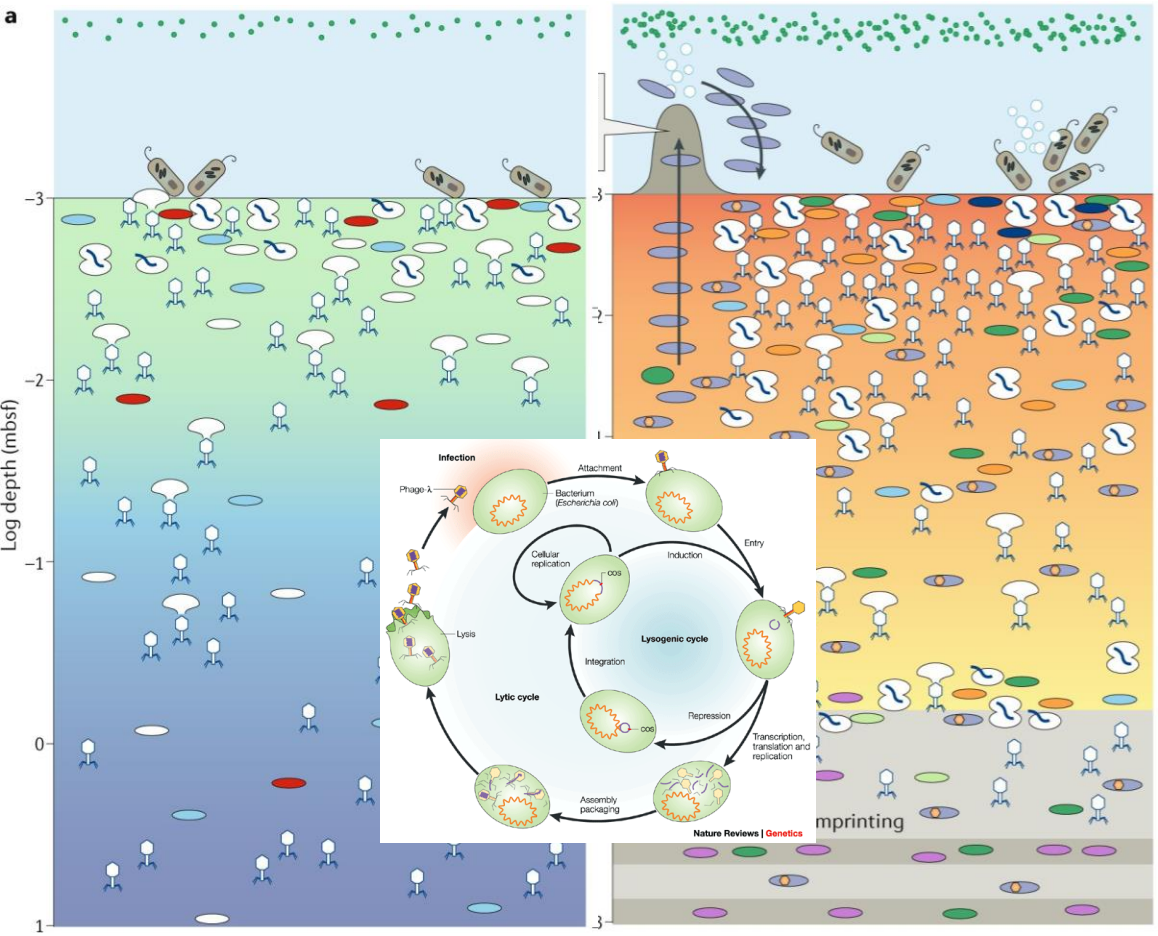

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Importance of Scientific Ocean Drilling

- *What is the geophysical, chemical, and biological character of the subseafloor environment and how does it affect global elemental cycles and understanding of the origin and evolution of life?*

— Sea Change: 2015-2025 Decadal Survey of Ocean Sciences

- *Fresh* cores are necessary to determine activity rates.
- *Deep* cores are the only way to access complete geochemical gradients.
- *Range* of cores from various subsurface locations and environmental conditions is essential to understand the biological impact on elemental cycles and evolution of life.