



























Miller 1983 carbon dioxide, nitrogen

Bada 2007

- nitrites, acidic soln
- + iron, carbonate minerals

Debate continues.... Abiogenesis wiki

e.g. Martin Nowak & Hisashi Ohtsuki (2008) Prevolutionary dynamics and the origin of evolution. Proceedings of the National Academy of Sciences



2. Assemble organic molecules into polymers

## Probably done?



Problem: rapid hydrolysis



Solution: minerals catalyse joining of reactive nucleotides into polymers



3. Assemble polymers into self-replicating organisms...



- RNA-world hypothesis (Walter Gilbert, 1986)
- Ribozymes catalyze enzymatic reactions (Czech & Altman, 1986)
- Lipids & polypeptide self-assembly => bilayers (microspheres)











Traces of animal life have been found in rocks dating back 635 million years

New methods - detect breakdown products of lipids (cholestranes)

=> Porifera ecologically impt then

Small colonies & bodies (mm)

Predates end of "snowball earth" => ?

Ancient sponges leave their mark (2009)

