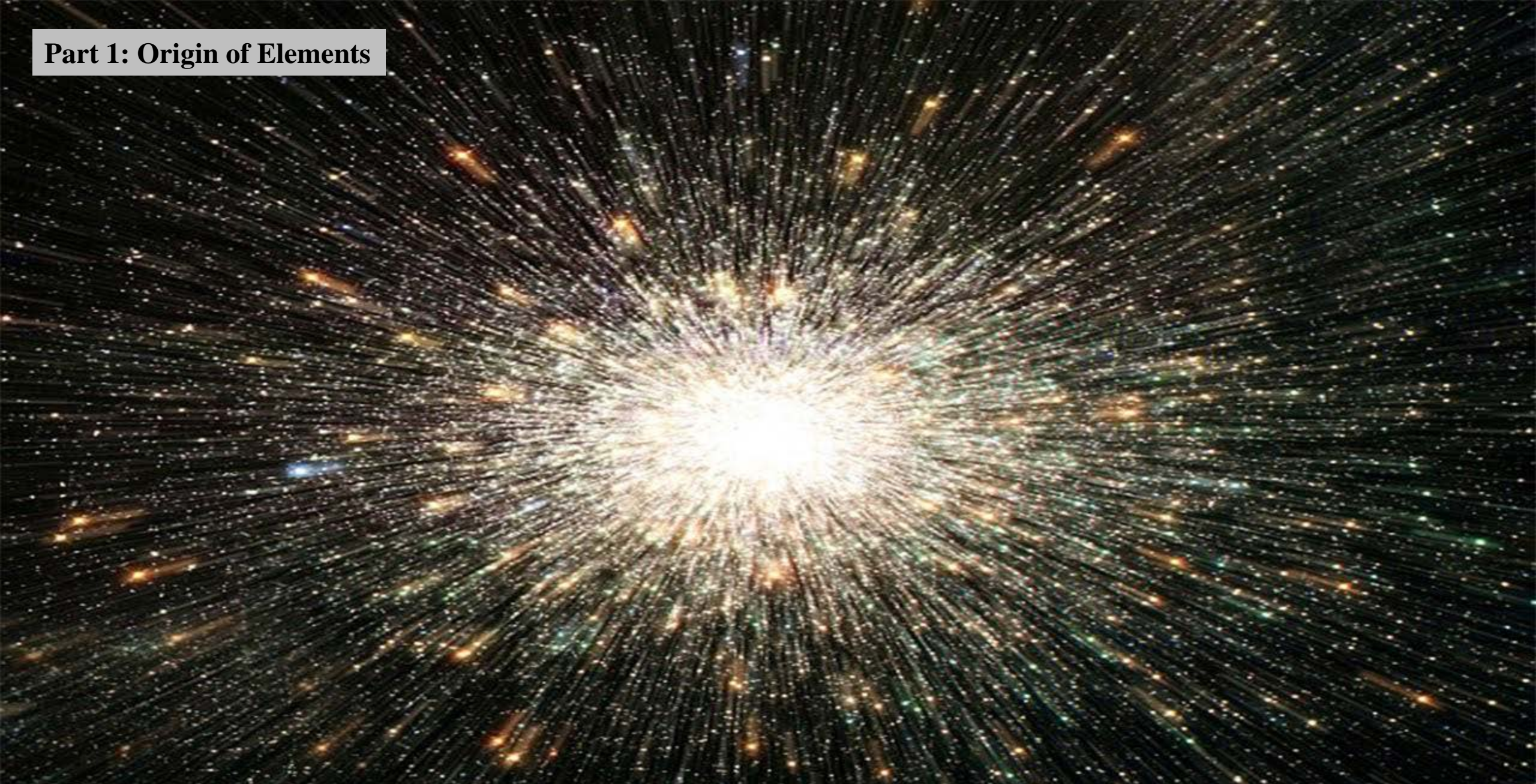


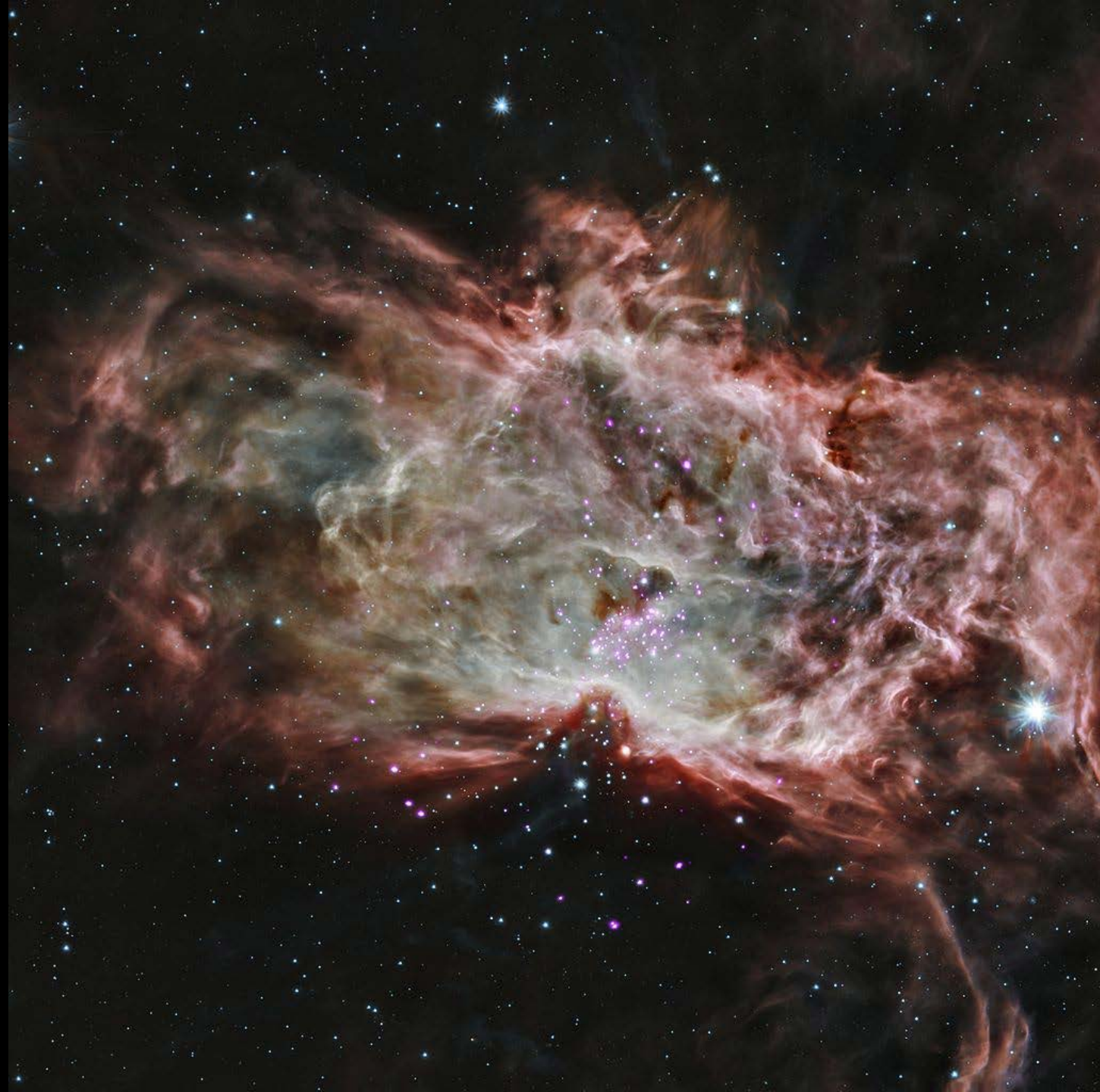
And now permit me to pass along one final thought. My major theme has been that all of the heavy elements from carbon to uranium have been synthesized in stars. Our bodies consist for the most part of these heavy elements. Apart from hydrogen, we are 65 percent oxygen and 18 percent carbon, with smaller percentages of nitrogen, sodium, magnesium, phosphorus, sulfur, chlorine, potassium, and traces of still heavier elements. Thus it is possible to say that each one of us and all of us are truly and literally a little bit of stardust.

William Fowler (1984)

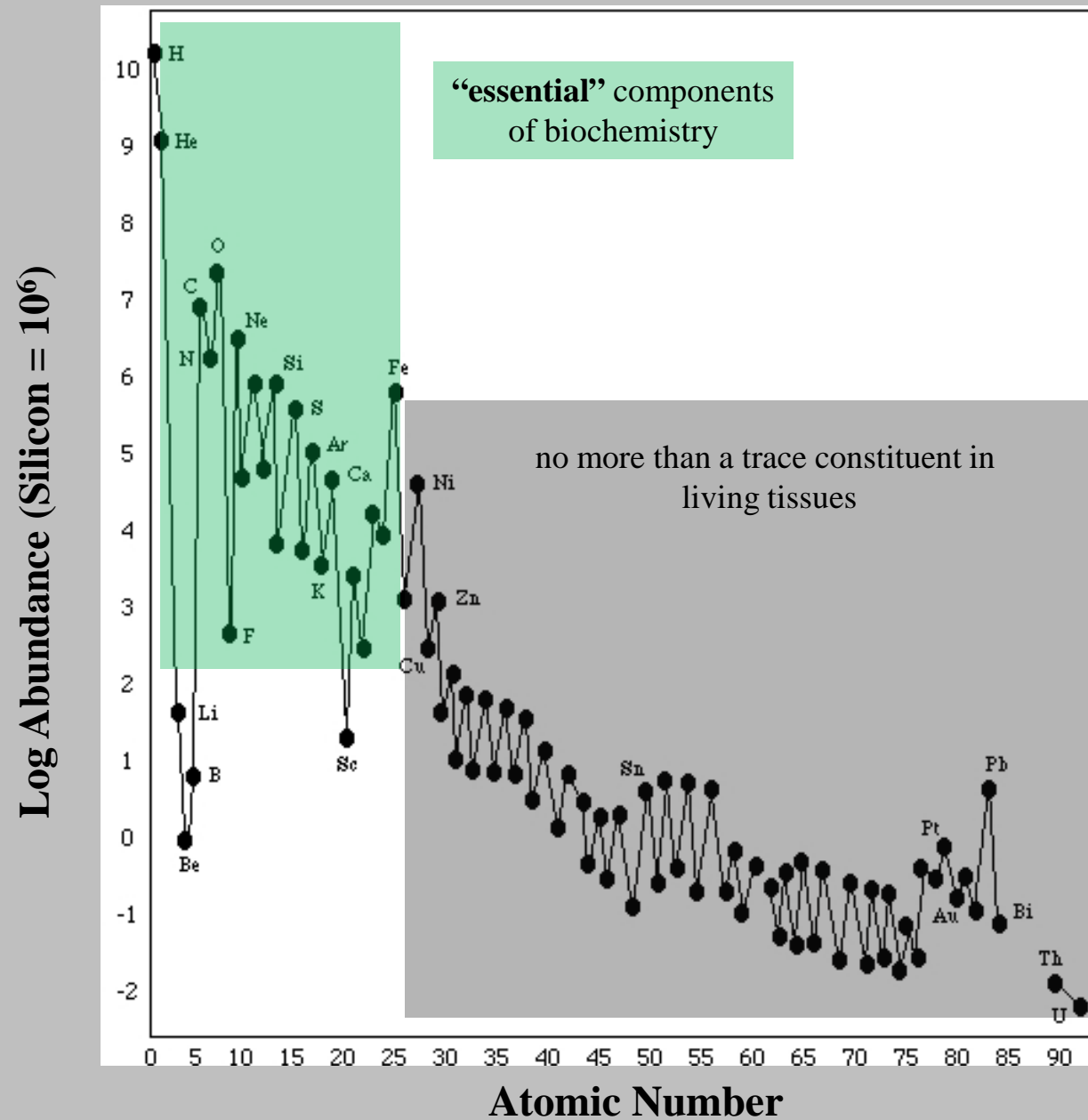
Part 1: Origin of Elements



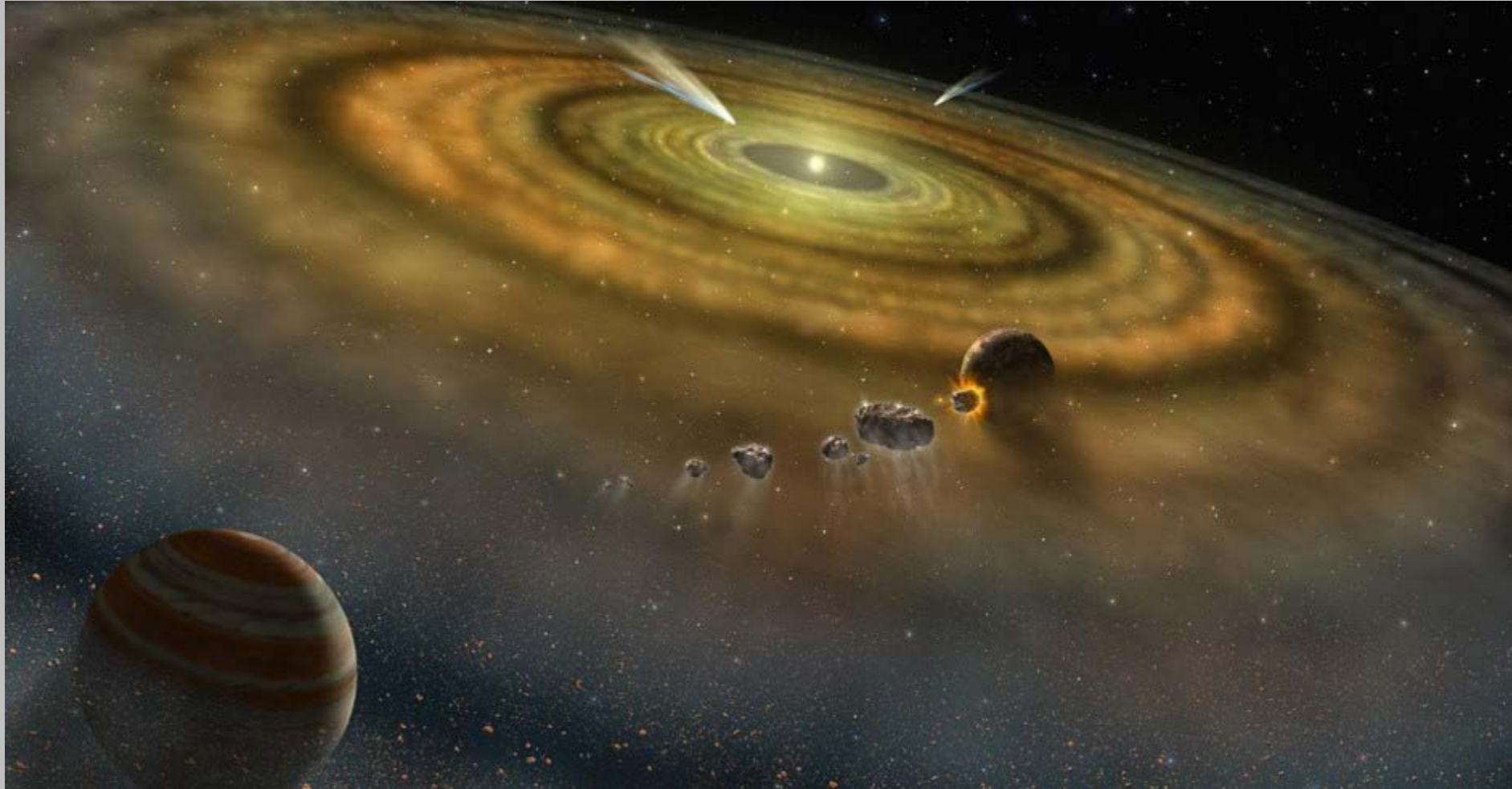
~13.7 billion years ago – the Universe was created with a gigantic explosion, astrophysicists call the “Big Bang.”



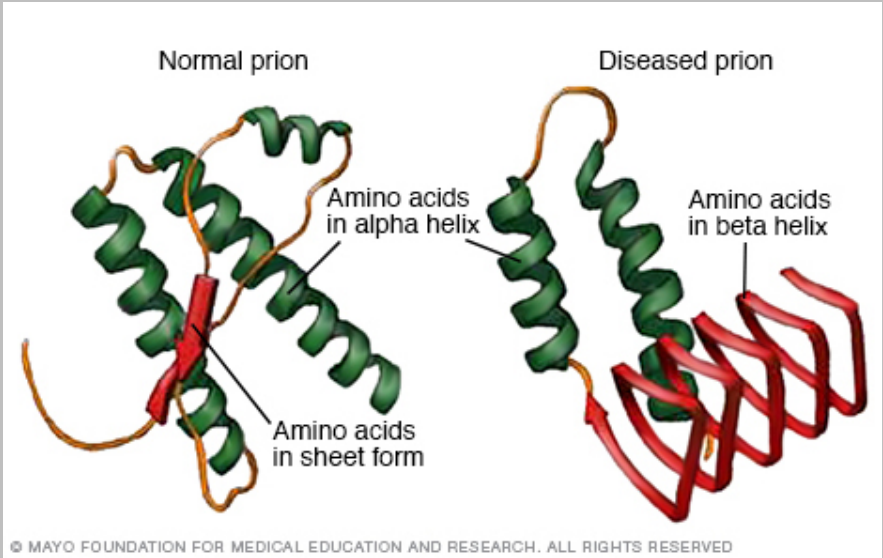
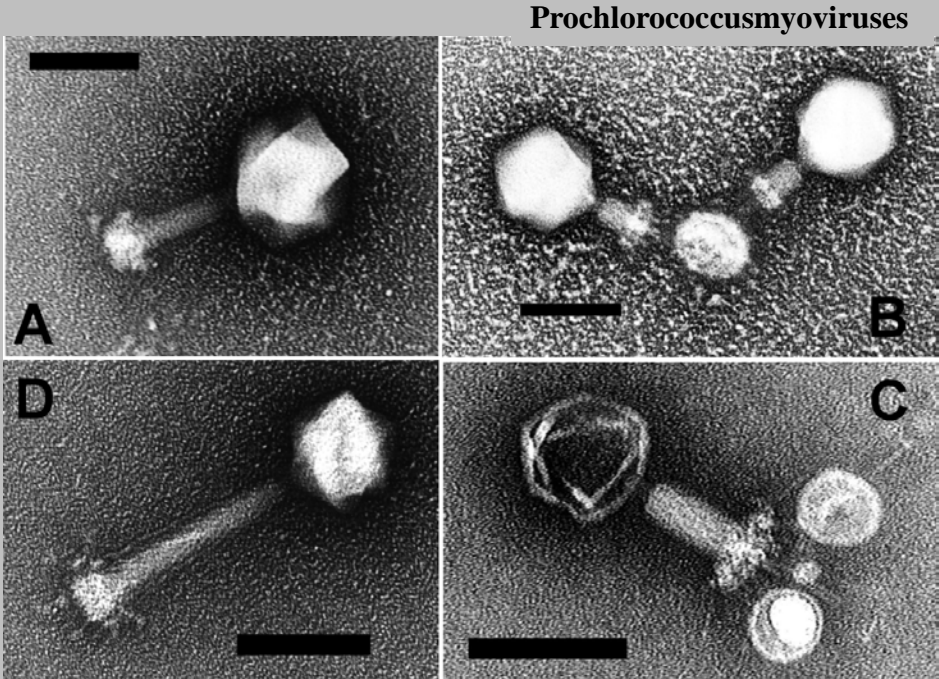
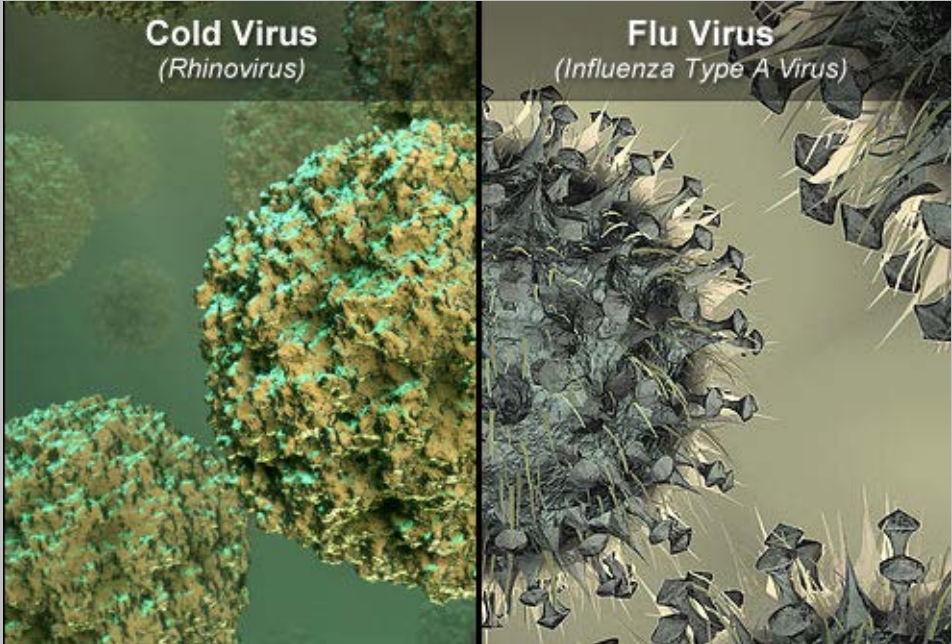
Relative Abundance of Elements in the Solar System



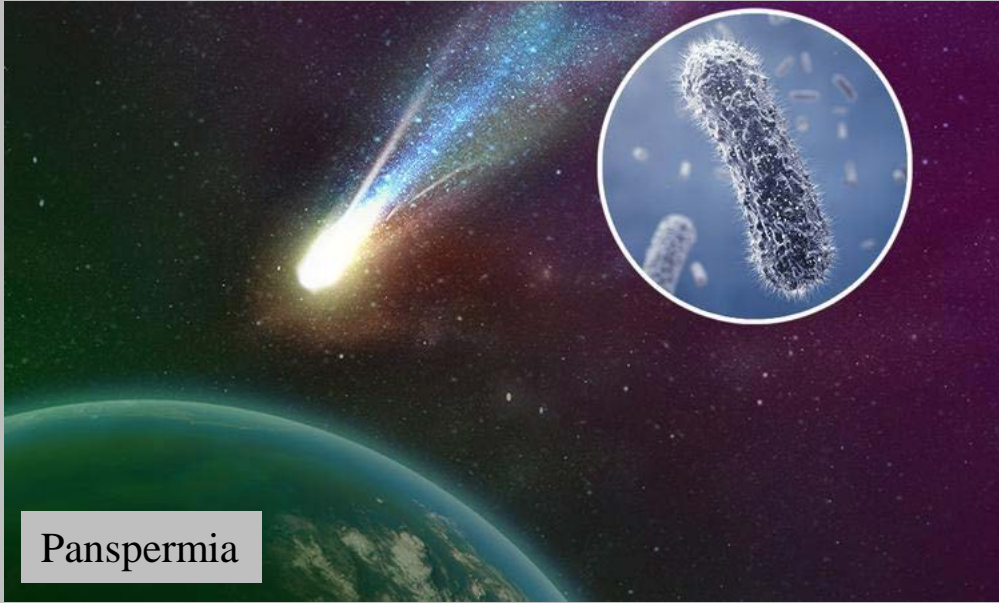
Part 2: Origin of Earth and Oceans



Part 3a: What is Life?



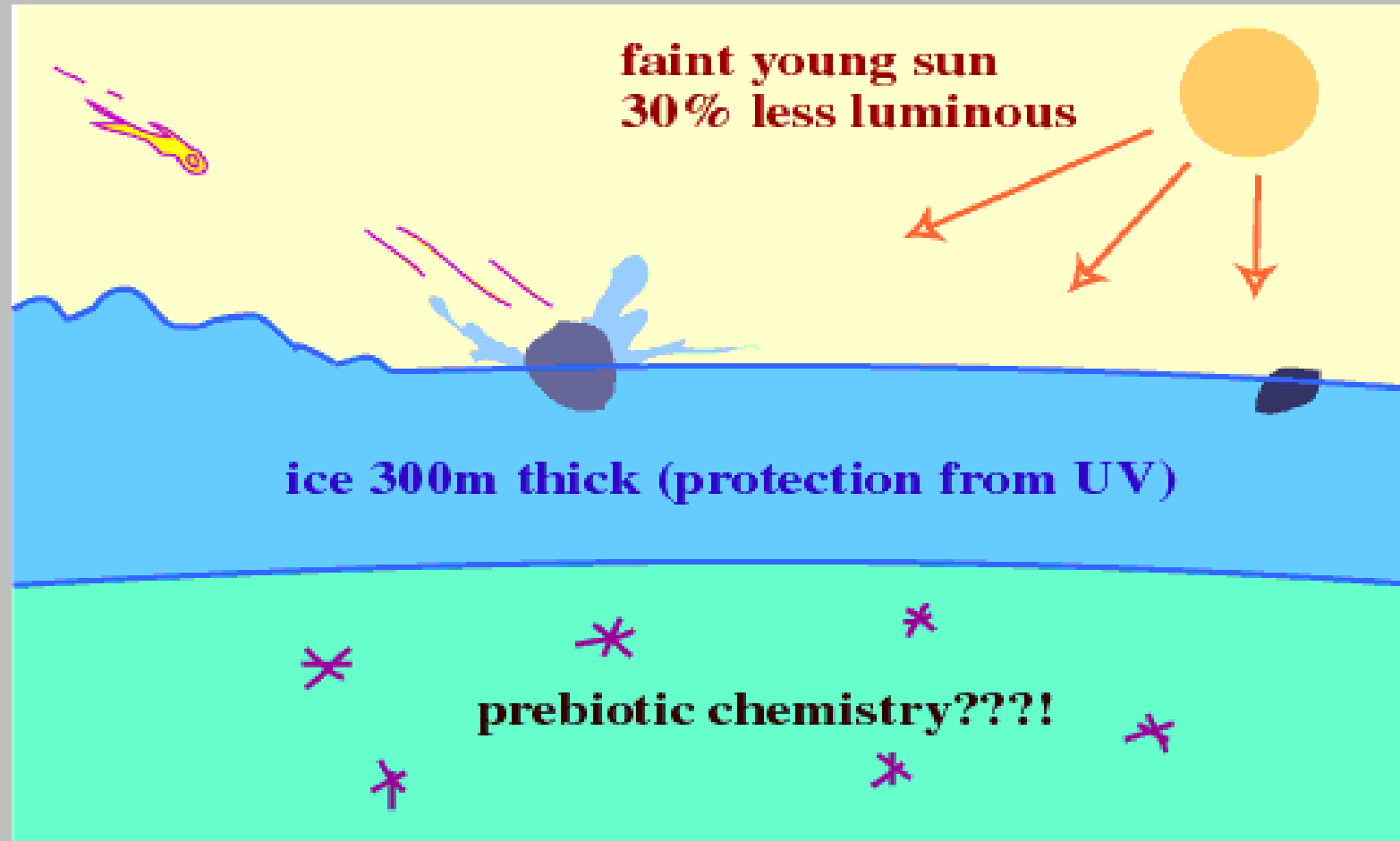
Part 3b: Origin of Life on Earth



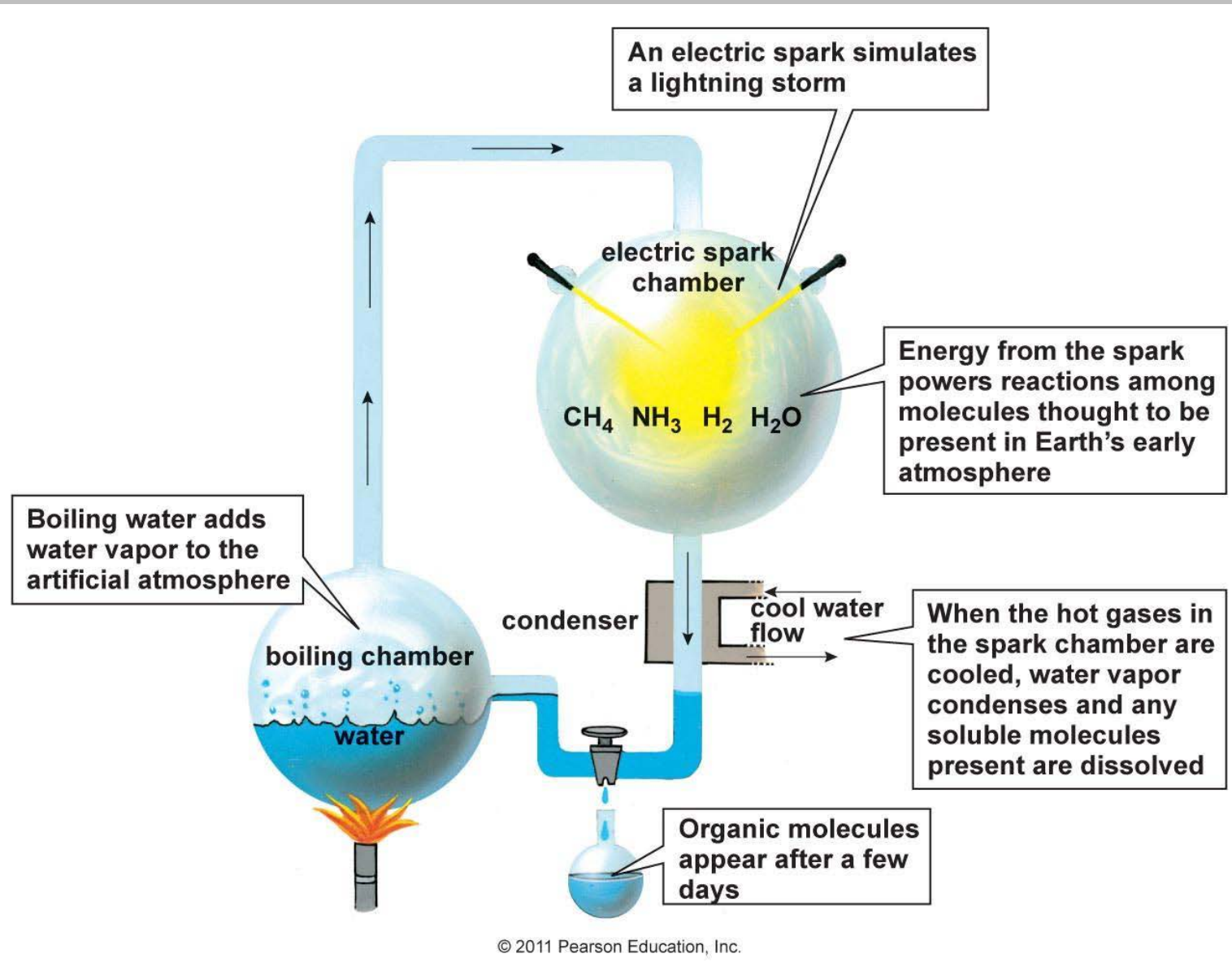
Meteorite – Australia



Frozen Ocean Theory



Miller-Urey Experiment



Darwin Correspondence Project

[Home](#) [The letters](#) [Commentary](#) [People](#) [Learning](#) [Resources](#) [About](#)

Search over 8000 letters and articles...

Search

[advanced search >](#)

[Transcript](#)

[Around this date](#)

[With this correspondent](#)

To J. D. Hooker 1 February [1871]¹

Down. | Beckenham | Kent. S.E.

Febr 1st

My dear Hooker

I return the pamphlets, which I have been very glad to read.— It will be a curious discovery if M^r. Lowne's observation that boiling does not kill certain moulds is proved true; but then how on earth is the absence of all living things in Pasteur's experiment to be accounted for?—² I am always delighted to see a word in favour of Pangenesis, which some day, I believe, will have a resurrection³ M^r Dyers paper strikes me as a very able Spencerian production.—⁴

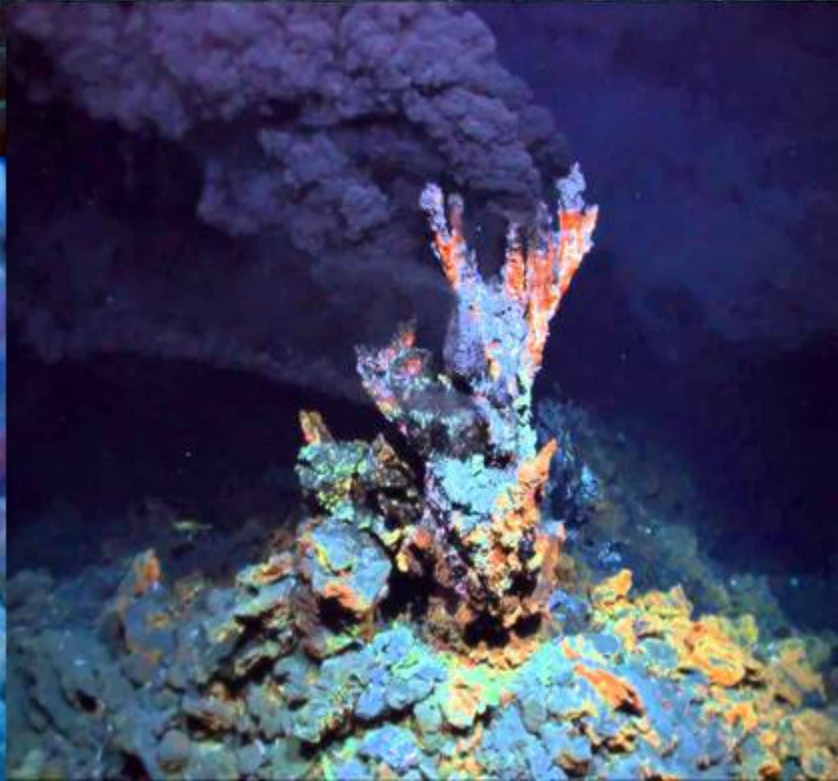
It is often said that all the conditions for the first production of a living organism are now present, which could ever have been present.— But if (& oh what a big if) we could conceive in some warm little pond with all sorts of ammonia & phosphoric salts,—light, heat, electricity &c present, that a protein compound was chemically formed, ready to undergo still more complex changes, at the present day such matter w^d be instantly devoured, or absorbed, which would not have been the case before living creatures were formed.—

Henrietta makes hardly any progress, & God knows when she will be well.—⁵

I enjoyed much the visit of you four Gentlemen, ie after the Saturday night, when I thought I was quite done for.—⁶

Yours affec^y | C. Darwin

Hydrothermal Vents



Geothermal Pools



Origin of first cells at terrestrial, anoxic geothermal fields

Amen Y. Mulkidjanian^{a,b,1}, Andrew Yu. Bychkov^c, Daria V. Dibrova^{a,d}, Michael Y. Galperin^e, and Eugene V. Koonin^{e,1}

^aSchool of Physics, University of Osnabrück, D-49069 Osnabrück, Germany; ^bA. N. Belozersky Institute of Physico-Chemical Biology and Schools of ^cGeology and ^dBioengineering and Bioinformatics, Moscow State University, Moscow 119992, Russia; and ^eNational Center for Biotechnology Information, National Library of Medicine, National Institutes of Health, Bethesda, MD 20894



ARTICLE

doi:10.1038/nature21377

Evidence for early life in Earth's oldest hydrothermal vent precipitates

Matthew S. Dodd^{1,2}, Dominic Papineau^{1,2}, Tor Grenne³, John F. Slack⁴, Martin Rittner², Franco Pirajno⁵, Jonathan O'Neil⁶ & Crispin T. S. Little⁷

3.7-4.28 bya
Quebec, Canada

Most recent tree of life

