

(summary notes)

1. Big Bang 15 billion years ago / our solar system 4.5 billion years ago [TM comment: we don't know if there are or have been an infinity of universes parallel to or preceding the universe we know about].
2. In the universe we know about, disorder increases over time – this is the Second Law of Thermodynamics, or Entropy.
3. Life is a self-replicating system that beats entropy temporarily by converting relatively ordered energy (sunlight, food, electric power) into a more disordered form of energy (heat). Thus life creates limited local order at the price of increasing surrounding disorder.
4. Present Earth life is carbon based (mostly) - no carbon at time of the Big Bang – protons & neutrons colliding gave rise to elements.
5. Life = a mechanism for reduplication + instructions for reduplication. Need not be biological.
6. Humans have already created “life” - computer viruses which steal energy from other entities to beat the law of entropy.
7. The biological mechanism for reduplication is the double helix of matching nucleic acids: adenine (chain 1) to thiamine (chain 2), and guanine to cytosine. The instructions are coded through sequences of these acids.
8. DNA or its unknown precursors might have formed on Earth with water + other chemicals + solar radiation, or it might have been transported from elsewhere (but that just displaces the origin mystery). The later formation of atmosphere on earth blocked (and blocks) the necessary radiation to recreate life again from elements.
9. Human DNA contains about 3 billion nucleic acids (instruction sets), but only about 100 million seem to be active. Those 100 million bits of information are about equal to the information in 5 Mills & Boon novels. 50,000 new books are published in English each year.

10. Plants, animals & humans have evolved so far mostly by the natural selection system of Darwinian evolution.
11. Humans have begun to supplant natural evolution with designed evolution. These designs will soon displace humans with super-humans. We will make our own species redundant.
12. Present biological humans could never survive interstellar travel. However they could design machines to survive interstellar travel, and those machines at various destinations could design other machines, thus populating the universe with non-human forms.
13. Why isn't the universe full of such machines already?
  - a) The random evolution of life may have a very low probability.
  - b) It has taken 2.5 billion years for single cells to evolve to our present form of complex intelligence. Stars near planets supporting possible life have a limited duration themselves (our Earth will cease to be a life- habitable zone in less than a billion years). It may be that evolution to the intelligent phase is very very rare because of this time factor.
  - c) Space is a very dangerous place. Stellar collisions are pretty common. It may be a sheer fluke that we have not been wiped out by a passing lump of rock already, and this may have happened to most evolving life forms.
  - d) It may be that intelligent life forms are prone to destroy themselves sooner rather than later (humans are good evidence) – thus making unlikely that large numbers of them exist elsewhere.

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