**Probable chemistry: Clues to the origin of life**

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All living entities consist of a cell with a boundary called the cell membrane, so all life’s reactions occur within this “sack”. Nothing new so far, but the cell is packed full of reaction by-products (e.g. CO2) and newly made peptides, as well as activated reactants e.g. 20 different types of charged and neutral amino acids and nucleotides. Also “clogging” up the cells are endoplasmic reticula, lysosomes, vacuoles, DNA, numerous different types of RNAs (including ribosomes), plasmids, mitochondria, centrioles, Golgi apparatus, starch granules, protein active sites and electrolytes (Na+, Cl-, K+, H+ etc), as well as amphoteric and triglyceride molecules.

In order for a cell to survive, peptides and other substrates have to travel to wherever else in the cell that they are needed e.g. transmembrane protein sites. This means that they have to negotiate many obstacles in order to reach their targets; not an easy task because they will be careering about blindly, knocking into one another and the rest of the cell’s contents and also being attacked by various radicals and proteolytic enzymes; their “safe” passage may also be blocked by other larger molecules and nano-machines (e.g. ribosomes) and not forgetting that water molecules, being bi-polar, will be a major barrier too. Then, ultimately, upon their eventual arrival at the place of destiny, the active site on the recipient enzyme may be facing the wrong way; the right orientation of both molecules has to be synchronised before any discernible intended activity can take place. Overcoming this level of chaos and difficulty would seem to be highly improbable as a cell appears to be a disordered environment rather than a cosy organised place, does it not?

However, despite all this, cells still manage to carry on with the business of living, performing appropriately necessary reactions and replication, often on a nanoscale time frame. The result being that the reactions which occur in cells can be referred to as *probable chemistry*, noting that such reactions were present during the very early chemical evolution of life. Such reactions have remained unaltered since before the very first emergence of a preLUCA.

So, what is probable chemistry? It is chemistry which occurs in three stages (a) self-organisation of molecules; (b) self-assembly of nanoparticles and (c) instructed chemistry. All these facets eventually led to the emergence of life, which in essence is super-hypercomplex chemistry.