Natural consequences of the terrestrial bubble-aerosol (bubblesol) cycle are objects with properties fascinatingly akin to those of ‘nanobacteria’: in particular the basic morphology (spheres and sausages), gross chemistry (suites of organics along with metals), and size distributions (nanometers to microns). Whether of biological or bubblesol origin, these striking similarities reflect the universality of the chemical physics involved in the interactions of charge-polarized organic amphiphiles at an air-water interface.

The bubblesol cycle on the contemporary Earth includes bubble formation and the adsorption of surface-active materials, bubble dissolution, and the non-equilibrium dynamics of bubble bursting. This leads to the formation of aerosols and their subsequent roles in atmospheric condensation.

'Membrane-like' phase boundaries are created at each node of this cycle, selectively concentrating organics and metal ions.

The bubblesol cycle thus provides a unique infrastructure for the concentration, and transport of organic compounds, metal ions, and mineral catalysts along with a rapid sequencing of hydration-dehydration events. This concentration of organics, metals, and catalytic surfaces in micro-environments undergoing multiple cycles of hydration-dehydration leads to conditions ideal, perhaps unique, for multiple-stage polymerization.

Thus this geophysical-chemical 'supercycle' seems likely to have played a critical role in prebiotic chemical self-organization on the early Earth; for on the contemporary Earth bubble generated aerosols and their atmospheric progeny are the largest transporters of organic matter between the atmosphere and ocean, in both particle number and total mass. Additionally, the bubblesol cycle generates the principle nodes of heterogeneous organometallic chemistry in both atmosphere and ocean. Hence whether considering Earth, Mars, Titan, or Europa… in the search for life and its origins the bubble-aerosol cycle, its processes, and resulting objects is a critical consideration.

With respect to the scientific concerns of mission planning for Mars:
♦ The finding of bubblesol-generated objects (of Martian origin) in Martian meteorites or on Mars itself is by itself strong evidence for the existence of a complex Martian hydrology cycle (capable of gathering, concentrating, and transporting organics).

♦ The presence of such bubblesol objects in (or from) an extraterrestrial location would demonstrate that substantial environmental opportunities have existed for the support of prebiotic chemical evolution.

♦ Specifically, on the tectonically simple early Mars (one having liquid water intermittently on its surface), such a complex hydrology cycle may well have been the only initiator and supporter of the rapid cycles of concentration, hydration, and dehydration necessary for organic polymerization in ‘bulk’ quantities.

♦ Thus, if chemical self-organization occurred on Mars it was likely to be a consequence of a bubble-aerosol cycle analogous to the terrestrial.

♦ Therefore any life-searching Mars missions (or interpretations of Martian objects having made their way to Earth) must discriminate between the fossils of living systems at the nanobacterial scale and potential artifacts of the bubble-aerosol cycle necessarily found on any planet, planetoid, or satellite having both liquid water and amphiphiles.

Additionally, IF bacteria (with surface active membrane elements) have existed on Mars, and were in any way tied to a surface liquid water environment then these same bubblesol processes could have been a prime mode of concentration and aerial transport. In analogy to current terrestrial processes the larger of these bubblesol-generated objects (in their hydrated state) could easily have transported such bacteria across a mostly arid planetary surface. This would have been useful for ‘colonization’, and could also explain the deposition and subsequent fossilization of "micro-clumps" of such bacteria in environments much removed from their origin.

Tens of billions of dollars of the chemical engineering industry are based upon the properties of the air-water interface embodied in the bubble-aerosol cycle. Experiments in prebiotic contexts are in process.