4 July 2019

Brig Klyce

c/o Cosmic Ancestry

Dear Brig

With a veritable surge of new discoveries by many individuals and groups who are now assisting in the progress of astrobiology, it is worth recounting a history of relevant events that I myself have witnessed throughout a long career. When I began my research in astronomy in 1960 interstellar dust (the material that makes up a percent of the mass of the galaxy) was thought to be made of inorganic ice crystals. The origin of life was then regarded as being fully explained by the classic Miller-Urey experiments of the 1950’s, so *abiogenesis* – the transition from non-life to life - was firmly set on Earth. Together with mentor and long-term collaborator Fred Hoyle I was the first to challenge the prevailing Oort-van de Hulst theory that ice grains can indeed even condense under interstellar conditions; and in 1962 we proposed the theory of carbon grain formation and of carbon dust in the outflows of carbon stars (1).

In 1974 I was also the first to propose an organic polymeric composition of interstellar dust (which we first thought was dominated by polyoxymethylene and later by polysaccharides) based on early infrared observations of both interstellar and circumstellar dust (2-4). Fred Hoyle and I were the first to attribute the famous 2175A bump in interstellar extinction to aromatic molecules in space (5); and shortly after this we began to discuss the idea of prebiotic organic molecules in space (6).

Following the pioneering astronomical observations by D.T. Wickramasinghe of a broad 3.4 micron absorption profile in the spectrum of GC-IRS7, Fred Hoyle and I next proposed our theory that biologically relevant organic dust was omnipresent in the galaxy (7) and that these were most likely to be derived from biology itself.

Not long afterwards we launched our theory of cometary panspermia and this was prompted to a large extent by D.T. Wickramasinghe’s first infrared observations of a comet - comet P/Halley. All this was followed by further arguments and theorising that eventually led to us proposing that comets are the main incubators/amplifiers of microbes in the galaxy and throughout the cosmos (8,9).

By 1986 the concept of astrobiology as an emergent scientific discipline was actually proposed by us in public lectures and publications and nurtured in its formative years. In the past 2 decades after Fred Hoyle’s death, I personally (together with a small team of collaborators) have continued to accumulate and review an ever-increasing body of new data from diverse fields that supports the cosmic life theory that we had diligently nurtured for over 5 decades. A small sampling of the relevant publications are given in references (10)-(13). In total, there is a grand tally of over 250 peer reviewed journal papers, with more than 50 published in the journal *Nature*. A recent reappraisal of some the supportive data for life as a cosmic phenomenon is to be found in a recent publication by Edward J. Steele et al (14)

As I enter the 80th year of my life I am gratified by the convergence of a vast body of scientific research that seems to overwhelmingly support the ideas that Fred Hoyle and I had nurtured over many decades. On the other hand, an endemic failure to acknowledge, or even reference, our prior published work stands out as a sad commentary on modern scientific conduct and integrity.

Yours sincerely

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