

## ***Interactive comment on “Comets, carbonaceous meteorites, and the origin of the biosphere” by R. B. Hoover***

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One of the main conclusions of this paper is that the endogenous origin of life must be replaced or modified by the possibility of exogenous origins. Although endo/exo appears to exhaust the places for life to begin, there traditionally exist four options given two variables: 1) endo only, 2) exo only, 3) endo + exo, and, 4) neither endo nor exo. Hoover makes the argument that endo-only cannot explain the comet data. He even suggests locations for exo origins. However, by not excluding options 3 and 4, I do not think the arguments necessarily support a Hoyle "panspermia", exo-only view (2).

For example, an endo+exo view might suggest that spontaneous evolution is so very easy that it starts up everywhere, and both Mars and Earth have evolved life. This would be in direct contrast to Hoyle's view that life was hard to get started, and hence

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had to come from outside the solar system.

Or perhaps, as Hoover hints, there is some sort of "universal imperative" that forces systems to self-organize, and life to begin. Whether that "law" would be classed as endo or exo or neither would depend on details of the philosophical argument.

So it seems to me that the debate is wider than endo vs exo, but should include a consideration of endo+exo (3) and "not endo or exo" (4) as well, especially if exo-only (2) is being promoted. Or if options 3 & 4 are inappropriate for this venue, then the strongest conclusion possible would be "not endo-only (not 1)", rather than "definitely exo-only (2)".

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