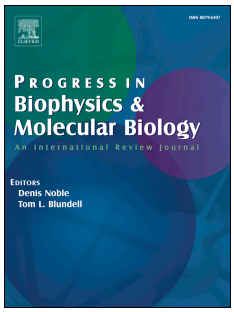
Accepted Manuscript



Reply to editorial and commentaries on Steele, Al-Mufti, Augustyn, Chandrajith, Coghlan, Coulson et al. (2018) "Cause of Cambrian explosion - Terrestrial or cosmic?"

Edward J. Steele, Shirwan Al-Mufti, Kenneth A. Augustyn, Rohana Chandrajith, John P. Coghlan, S.G. Coulson, Sudipto Ghosh, Mark Gillman, Reginald M. Gorczynski, Brig Klyce, Godfrey Louis, Kithsiri Mahanama, Keith R. Oliver, Julio Padron, Jiangwen Qu, John A. Schuster, W.E. Smith, Duane P. Snyder, Julian A. Steele, Brent J. Stewart, Robert Temple, Gensuke Tokoro, Christopher A. Tout, Alexander Unzicker, Milton Wainwright, Jamie Wallis, Daryl H. Wallis, Max K. Wallis, John Wetherall, D.T. Wickramasinghe, J.T. Wickramasinghe, N. Chandra Wickramasinghe, Yongsheng Liu

PII: S0079-6107(18)30082-8

DOI: 10.1016/j.pbiomolbio.2018.03.007

Reference: JPBM 1327

To appear in: *Progress in Biophysics and Molecular Biology*

Please cite this article as: Steele, E.J., Al-Mufti, S., Augustyn, K.A., Chandrajith, R., Coghlan, J.P., Coulson, S.G., Ghosh, S., Gillman, M., Gorczynski, R.M., Klyce, B., Louis, G., Mahanama, K., Oliver, K.R., Padron, J., Qu, J., Schuster, J.A., Smith, W.E., Snyder, D.P., Steele, J.A., Stewart, B.J., Temple, R., Tokoro, G., Tout, C.A., Unzicker, A., Wainwright, M., Wallis, J., Wallis, D.H., Wallis, M.K., Wetherall, J., Wickramasinghe, D.T., Wickramasinghe, J.T., Wickramasinghe, N.C., Liu, Y., Reply to editorial and commentaries on Steele, Al-Mufti, Augustyn, Chandrajith, Coghlan, Coulson et al. (2018) "Cause of Cambrian explosion - Terrestrial or cosmic?", *Progress in Biophysics and Molecular Biology* (2018), doi: 10.1016/j.pbiomolbio.2018.03.007.

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Within an individual scientist a paradigm shift occurs in two stages:

1). An instant personal decision to embrace the new global way of understanding reality. This happens within a blink of an eye, as in a Gestalt shift made famous by Thomas Kuhn. The individual confronting the data compares the available evidence for and against - a piece of evidence clicks into place which only makes sense under the new alternative paradigm, and is quite nonsensical under the old way of understanding the world.

2). This personal decision can then move into the public domain but there are many inhibitory processes as the scholar and scientist has to weigh up the socio-political costs, such as: How will this affect my relationships with colleagues? How will this affect my prospects for promotion? How will this affect my future prospects for research funding? etc.

The more fundamental the shift the deeper is the problem for successfully moving to stage 2. However these shifts do happen regularly in Science and are largely accrued community decisions over time. (See https://en.wikipedia.org/wiki/Paradigm_shift.) It is an intellectual battle as described in that Wiki article:

> *When enough significant anomalies have accrued against a current paradigm, the scientific discipline is thrown into a state of crisis, according to Kuhn. During this crisis, new ideas, perhaps ones previously discarded, are tried. Eventually a new paradigm is formed, which gains its own new followers, and an intellectual "battle" takes place between the followers of the new paradigm and the hold-outs of the old paradigm.*

The battle between rival paradigms on the origin and further evolution of life on Earth is underway and we look forward to more scientists engaging in it. The battle should enrich and spur on each paradigm. However we agree that the thesis that life is a cosmic phenomenon is generally considered inadmissible by the body politic of scientists today. The intellectual shift in the population of scientists to the cosmic perspective will, of course, be protracted particularly in the messy final stages - for example as occurred in the first Copernican revolution - which are likely to continue for some time. Thus to directly quote Kuhn:

> .....*The state of Ptolemaic (Earth-centred) astronomy was a scandal before Copernicus' announcement. Given a particular discrepancy, astronomers were invariably able to eliminate it by making some particular adjustment in Ptolemy's system of compounded circles. But as time went on, a man looking at the net result of the normal research effort of many astronomers could observe that astronomy's complexity was increasing far more rapidly than its accuracy and that a discrepancy corrected in one place was likely to show up in another* (Kuhn 1969).

We have therefore resisted the temptation to respond in detail to the interesting Commentaries by Keith Baverstock (2018) and Karin Moelling (2018). We agree with the Editor Denis Noble (2018) that the whole issue is on the verge of being decided by decisive evidence of extra-terrestrial life being found elsewhere in our solar system, particularly in the water rich warmed interiors of comets and moons (and their snap frozen ejecta). We have laid out all the key data, analyses and critical arguments why we believe there is already wide ranging supportive evidence collected over the past 50 years by Fred Hoyle, Chandra Wickramasinghe and their associates, many of whom are co-authors of this review. We urge those interested to read our article, then read the key books and papers cited in the primary literature. On this we rest our case but we are of course open to further email discussions. As the Editor has done we also thank the authors of the Commentaries for sharing their arguments in print, and the four anonymous referees for their careful work.

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Karin Moelling (2018) Commentary to: " **Cause of Cambrian Explosion - Terrestrial or Cosmic?** Steele, E.J. et al " to accompany the article by Steele et al in *Progress in Biophysics and Molecular Biology*

Denis Noble (2018) Editorial to: " **Cause of Cambrian Explosion - Terrestrial or Cosmic?** Steele, E.J. et al " to accompany the article by Steele et al in *Progress in Biophysics and Molecular Biology*

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