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Opinion Article

On the Ambiguity of Firsts: Symbiogeny and Evolutionary Creativity

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ABSTRACT

I want to take issue with static concepts of origins. Predecessors of what exists at present are not necessarily what came first.

It isn't as if the problem of identifying origins is unique to biology. Western culture is dominated by concepts of origins firmly rooted in the present. Historically, Western religions have assigned priority to what exists by anointing it with attributes of origins and characterizing these attributes as fundamental. God, after all, is said to have created man in his image amounting to a first among firsts. At the expense of God's image, symgiogeny theory flies in the face of the rule that what is must have its origin in something similar that came before.

My object here is to examine how originary prejudices distort questions of origins and the attributes of ancestors. I'm especially eager to strip away notions of original characteristics from present organisms. I want to imagine what was different in the past.

INTRODUCTION

Linguists have confronted stagnant concepts of forms of languages and the functions of grammatical patterns [1]. Similarly, biologists have long known that "we have a major gap in the stem leading to the Urbilataria. We have lost the hope, so common in older evolutionary reasoning, of reconstructing the morphology of the "coelomate ancestor" through a scenario involving successive grades of increasing complexity" [2].

This problem is epitomized by the overarching conflict in concepts of stem cells: Whereas "attempts to find... rare, 'professional' stem cells have been successful in some tissues, in others... repair can involve regression of differentiated cells into a less- differentiated state from which they repopulate the tissue" [3]. Were biologists to emulate linguists, interest in stem cell origins may solve this problem [4].

THE PROBLEM AND SOLUTION

The problem of firsts is not that there can't be an original or unique type at the beginning of a trend. The problem is, "What came before?" Typically, whatever it was that came before is given little originary consideration since the original type follows uniquely without identical antecedents. And therein lies the conundrum: If what came before is identical to what comes after, nothing came before or the origin is identical to whatever came before. It seems to me, that the latter, that the original is there to begin with, is the preferred model, since it requires no explanation for the origins of the original and allows the original to grow, expand, and change without restraint.

In other words, change from the original is what is crucial for origins. Therefore, what came before is irrelevant or the same as the original, and everything that follows is derived from this super-original through a mechanism that did not exist before the original.

The solution to the problem of narrow-mindedness is openness. Specifically, if biological evolution began with the Cambrian, then prior to the Cambrian, evolution occurred through a different mechanism. My point is that symbiogeny, the merging and subsequent cooperation of multicellular forms in composite organisms [5] could have been such a mechanism. Were symbiogeny to have been extant prior to the Cambrian inter-species merging (symbiosis) would have been available, and the change precipitated in the Cambrian would be recognized by the elevation of barriers to further inter-specific combination.

The possibility of endosymbiosis has been amply justified by molecular biology. Now is the time to take seriously the numerous possibilities suggested by symbiogeny.

Look at stem cells. My approach to understanding the origins of stem cells [6,7] arose from my research on the legendary, if exaggerated, immortality of Hydra's interstitial cells [8], on endosymbiosis [9,10], and the derivative concept of symbiogeny [11-14].

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To begin with, I stripped ancient metazoans of species exclusivity-high barriers to mergers. My guess was that living things have not always been as exclusive as they seem to be today. Without species specificity inhibiting mergers, living forms may have entered a vast variety of productive relationships. Symbiogeny may then have had unique and creative consequences. Hopefully, genomics and algorithms identifying sequence similarities may discover symbiogenic links among erstwhile ancestors. In addition, rhythms and rhymes in cellular activities among present organisms may identify and illuminate primary symbiogenic pathways.

For example, take macrophages. Isn't it possible that the similarity between and pond scum (Acanthoamoeba) exposes evolutionary affinities [15]?

Or take metazoan stem cells. Some organs have them while others do not. Isn't it conceivable that tissues having stem cells (e.g., blood and striated muscle) originated differently from tissues lacking them? Isn't it conceivable that tissues with stem cells arose from different evolutionary sources than tissues without stem cells?

And take hair follicles (feather follicles and scales) or intestinal glands in vertebrates. Isn't it conceivable that they have their origins in something like proterozoic hydras merging with the primitive integument and gut of other primordial metazoan forms? Isn't it conceivable that something like hydra's interstitial cells (the stem cells that give rise to cnidocytes, nerve, gland, and adhesive foot cells in otherwise epithelial animals) are the source of specialized integumentary and gland cells in present organisms. Isn't it conceivable?

REFERENCES

1. https://dlc.hypotheses.org/1210
2. Adoutte A, Balavoine G, Lartillot N, Lespinet O, Prud'homme B, de Rosa R. The new animal phylogeny: Reliability and implications. Proc Natl Acad Sci USA. 2000;97 (9):4453-4456.
3. Muñoz-Cánoves P, Huch M. Definitions for adult stem cells debated. Nature. 2018;563(7731):328-329.
4. https://www.scientificamerican.com/article/mother-of-all-cells/
5. Shostak S. (Re)Defining stem cells. Bio Essays. 2006;28(3):1-8.
6. Shostak S. Speculation on the evolution of stem cells. Breast Dis. 2008;29:3-13.
7. Shostak S. Symbiogeny and the evolution of tissues: The hypothesis. Biol syst Open Access. 2015;4(1):127.
8. MartÍnez DE, Bridge D. Hydra, the everlasting embryo confronts aging. Int J Dev Biol. 2012;56 (6-8):479-487.
9. Margulis L. Origin of eukaryotic cells: evidence and research implications for a theory of the origin and evolution of microbial, plant, and animal cells on the precambrian earth. New Haven, CN: Yale University Press, 1970;pp:1-349.
10. Margulis, L. Symbiosis in cell evolution: Microbial communities in the archean and proterozoic eons. San Francisco, CA: W.H. Freeman, 1981.
11. Margulis L, Corliss JO, Melkonian M, Chapman DJ (Eds.). Handbook of Protoctista, Jones and Bartlett. Boston, pp: 36-52.
12. Shostak S, Landy M. Symbiogeny and the rhizomatic. Trends Devel Biol. 2016;9:17-26.
13. Shostak S. Quantum budding and symbiogeny in Hydra. Trends Develop Biol. 2018;in press.
14. Siddiqui R, Khan NA. Acanthoamoeba is an evolutionary ancestor of macrophages: A myth or reality? Exp Parasitol. 2012;130(2):95-97.