

## **The Debate Between Dr. Jerry Bergman vs. Dr. Dan Stern**

### **Cardinale- Common Design or Common Descent?**

Author

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## **Single-Celled to Multicellular Evolution Observed in Algae? [1](#)**

In the debate, Dr. Dan Stern Cardinale stated, in support of *de novo* evolution of multicellularity, that “a new species of green algae that had no multicellularity in its evolutionary history evolved. In about two years in the lab, they evolved into an obligatory multicellularity organism even though they had no multicellularity in their life cycle. It wasn’t that individual cells just accumulate in a colony, but divided and formed multicellularity as humans do.”(1:44)

The evolution of multicellular life, as explained by University of Montana Biological Science professor, Matthew Herron, was a critical step in evolution. A major reason was that the “transition from unicellular to multicellular life was one of a few major events in the history of life that created new opportunities for more complex biological systems to evolve.” [2](#) A major problem is defining multicellularity:

“some definitions require cells to display an overall coordination of function have physical contact and strong interactions others are simply based on the presence of a group-morphology. ... it is important to be more precise when using the term multicellularity as, for example, a microbial colony differs in important ways from a multicellular organism like us. [3](#)

According to Rose et al., the clumping together of individual cells does not meet the definition of multicellularity. Nor does the existence of integrated multicellular organisms. Rather, multicellularity “is an outcome of evolutionary processes, not a starting condition.” [4](#) True multicellularity requires sustained cell-to-cell interconnection, communication, and cooperation to function as a unit. Does the

article Dan used to document his claim that de novo origins of multicellularity have been documented to occur in one generation, hold up?

## **What the Experiment Actually Found**

The article's example meets none of the conditions required to evolve from single-celled existence to the multicellularity existing in higher-level organisms. One possibility is the clumping could be a design trait that is utilized (adaptive reaction) in certain limited proper environments. Predation has long been hypothesized as an ecologically plausible mechanism that could explain at least some origins of both clumping and multicellularity.

The reason is most predators can only consume prey within a narrow range of sizes and the clumping response puts them outside of that range, thus not viable prey. In this case, the presence of a predator triggered what appears to be a pre-existing ability that allows algae to clump which protects it from predators. It could also be a response due to epigenetics, in this case the influence of the environment on regulating genes by blocking the transcription of some genes and/or allowing the transcription of other genes.

There appears to be pre-programmed genetic algorithms present that grants the remarkable ability of these organisms to adapt accordingly, if given the right environmental stressor (in this case, a predator). To restate, the introduction of a predator allowed for a design feature to help it survive in its environment. This is better understood as phenotypic adaptation than a macroevolutionary change.

These organisms may have been able to move between free-living and clumping but lost this ability due to deleterious mutations. As a consequent, they are now stuck in the clumping mode. This fact would indicate that this example of large-scale live action adaptation is also reductive thus, functionally compromising. Therefore, what Herron et al., found was not evolution by mutations changing gene codes as evolution requires, but of an innate clumping mechanism that is the result of a built-in or epigenetic modification.

## **Summary**

This case does not support the evolution of multicellularity required in higher animals for many reasons. One is because it lacks sustained cell-to-cell

interconnection, communication, and cooperation. The adaptation also does not meet the definition of evolution because it did not involve the mutation-induced alterations of genes, thus changing the genetic code by adding information which then alters the protein design produced. The fact is, the lack of evidence for the evolution of multicellularity, as summarized by Herron et al., is still true today.

For most multicellular groups, little or no fossil evidence exists that is relevant to the first steps in the transition from unicellular to multicellular life. Comparative methods suffer from a lack of intermediate forms between the multicellular organisms we are interested in and their extant unicellular relatives. Furthermore, direct knowledge of unicellular ancestors is not available. Extant unicellular relatives often serve as stand-ins, but this is a poor approximation. [4](#)

- [1](#)

<https://www.youtube.com/watch?v=xCR7PUGnrJg> .

- [2](#)

Herron, M.D., J.M. Borin, J.C. Boswell et al. 2019. De novo origins of multicellularity in response to predation. *Science Rep*9:2328. <https://doi.org/10.1038/s41598-019-39558-8>.

- [3](#)

Rose, C.J., and K. Hammerschmidt. 2021. What do we mean by multicellularity? The evolutionary transitions framework provides answers. *Frontiers in Ecology and Evolution*. <https://www.frontiersin.org/journals/ecology-and-evolution/articles/10.3389/fevo.2021.730714/full>, November 18.

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Rose and Hammerschmidt, 2021.

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