The Marine Biological Association

Established 1884, incorporated by Royal Charter

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Understanding our ancestors: New research uses marine model organisms to advance our understanding of how animals evolved

A new Marine Biological Association study in collaboration with researchers at the University of California, Berkeley has reconstructed detailed 3D images of cells that represent the closest cousins of the animals. This new work peels back the mysteries of how cells differentiated leading to the appearance of animals.

The research, led by MBA research student Davis Laundon and former MBA research fellow Pawel Burkhardt, focused on choanoflagellates, a type of microscopic aquatic organism that is the closest single-celled relative of animals. Choanoflagellates are a free-living form of 'collar cell', a type of cell found within many kinds of animals from sponges to starfish, and can exist as single cells and in multicellular form. Studying the structure of the choanoflagellate collar cell can therefore shed light on how animal multicellularity and cell differentiation may have evolved.

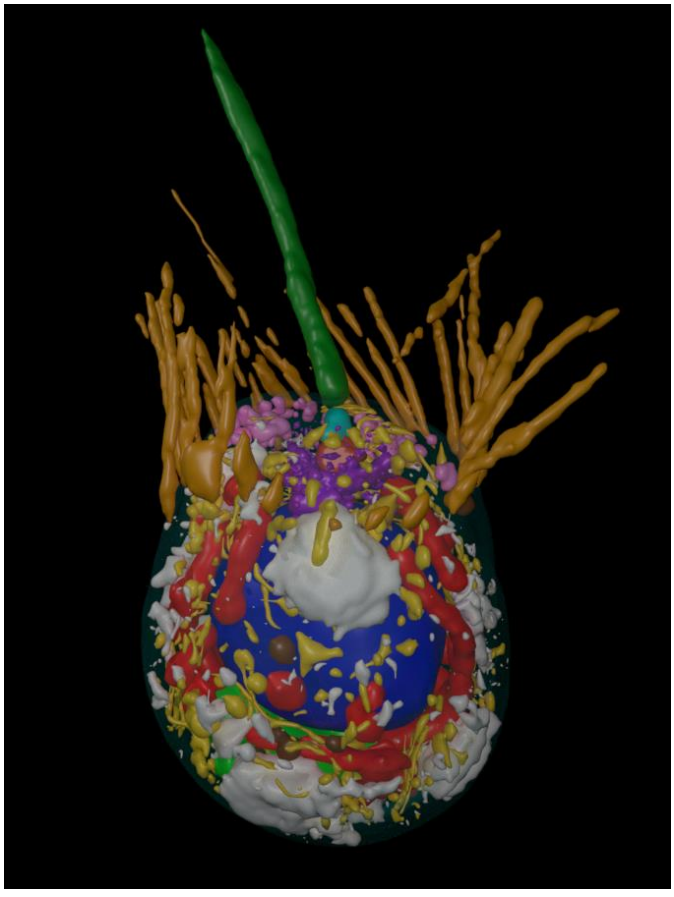

Figure 1. Choanoflagellates are aquatic microbes that represent the closest single-celled relatives of the animals. The image shows the internal 'organelles' of the cell, and the crown of microvilli (orange) which, along with a whip-like structure known as a flagellum (dark green), are characteristic of collar cells.

This study, published in *PLoS Biology*, compared the internal structure of single-celled and multicellular choanoflagellates, as well as the collar cells from a marine sponge, one of the most early-evolving animals. To create these striking images, Laundon and colleagues used transmission electron microscopy on ultrathin sections of the cell. The 3D reconstructions were then analyzed to reveal their internal structure, and clues to how they may differentiate into other cell types.

A significant finding is that when choanoflagellates divide into 'colonies', differentiated cell types are observed. MBA PhD student Davis Laundon described the findings "as an important step in our understanding of the biology of the last common ancestor of the animals".

The first animals originated from the sea, and this work shows how important studies of marine 'model' organisms are for advancing our knowledge of fundamental biology.

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The Marine Biological Association (MBA) is a professional body for marine scientists with some 1,600 members world-wide. Since 1884 the MBA has established itself as a leading marine biological research organization contributing to the work of several Nobel Laureates and over 170 Fellows of the Royal Society. In 2013, the MBA was awarded a Royal Charter in recognition of its long and eminent history and its status within the field of marine biology. The award strengthens the Association's role in promoting marine biology as a discipline and in representing the interests of the marine biological community. The Association is based at its world-class marine research laboratory in Plymouth.

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