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A Microscopic Analysis of Gastrulation in the Cnidarian, *Nematostella vectensis.*

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Gastrulation is one of the central events of metazoan development and the first morphogenetic process in the embryo. Strategies for transitioning from a monolayered blastula to a multilayered gastrula involve many different types of cellular behaviors including invagination (the coordinated movement of sheets of cells into the interior of the embryo), epiboly (the spreading of cells over the surface of the embryo), delamination (mitoses in which the spindle is oriented perpendicular to the embryo surface, resulting in one daughter remaining on the surface, and the other entering the blastocoel) and ingression (the migration of individual cells to the interior of the embryo)[1]. While much progress has been made recently investigating the molecular basis of gastrulation in model organisms such as the fruit fly and mouse, relatively little is known from non-model systems. Understanding how this process is controlled in more "primitive" metazoans will help in determining the evolutionary history of gastrulation mechanisms.

Recent molecular evidence places the phylum Cnidaria as the sister group to the bilaterians, bilaterally symmetric organisms such as the fruit fly, mouse and human[2,3]. Cnidarians are radially symmetric and diploblastic, that is, they possess only two germ layers. They consist of an outer ectoderm and inner entoderm (corresponding to the endoderm of other organisms) and lack the mesoderm present in triploblastic species. Despite their simple body plan and their position as basal metazoans, all of the gastrulation strategies found in bilaterians can be found in cnidarians[4]. To date, most work investigating the molecular basis of cnidarian development has been done on two classes of cnidarians, anthozoans (the coral *Acropora* and the starlet sea anemone *Nematostella vectensis*) and hydrozoans (largely the freshwater hydroid, *Hydra* and the marine hydroid, *Podocoryne carnea*). However, recent molecular and morphological data support a basal position for the Anthozoa, making this group the most relevant for comparison to bilaterian taxa[5].

Due to its advantages as a laboratory organism, *Nematostella vectensis* has emerged recently as a model cnidarian in which to investigate the molecular basis of development[6]. Gastrulation in *Nematostella* occurs through a combination of invagination and unipolar ingression (reference 6 and see Fig. 1). In this mode of gastrulation, cells on one side of the embryo invaginate and form an archenteron. This is accompanied by the ingression of individual cells from the tip of the archenteron into the blastocoel. The genes involved in regulating this process in *Nematostella* are not known. As a first step in determining the cell biological mechanisms underlying gastrulation in *Nematostella* we are characterizing the cellular behaviors that occur during this process in detail. A close examination of cell shape changes and cytoskeletal dynamics through a combination of confocal microscopy, timelapse and EM studies are identifying whether cellular mechanisms utilized in other metazoans are occurring in *Nematostella.*

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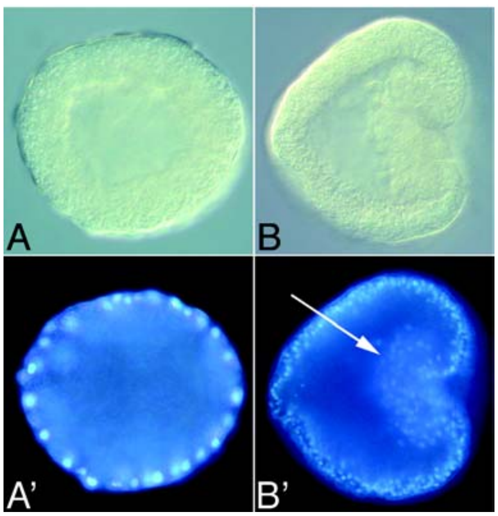

FIG. 1: Gastrulation in *Nematostella vectensis*.
In all images, oral is right. DIC images of (A) blastula and (B) gastrula stage embryos. (A',B') Nuclei in embryos in (A,B) visualized with Hoechst. Arrow indicates ingressing cells..

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