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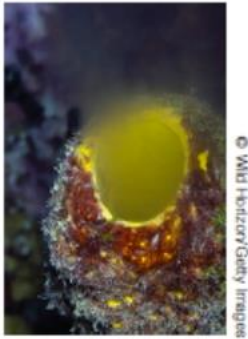
The origins of gastrulation

Some controversy surrounds the question of whether sponge embryos undergo the quintessential process of gastrulation—those cell movements in the animal embryo that produce the germ layers and primitive gut (see [Section 1.3](#)). In most cases, the adult sponge is created indirectly, through the metamorphosis of a free-floating larva—a physical change from a spherical embryonic and larval body type to the adult, ground-attached, filter-feeding chamber (see [Figure 1](#)). It is irrefutable, however, that the sponge embryo and larva both have a well delineated anterior-posterior axis with inner and outer tissues. This suggests the early origins of epithelial tissues (nonmigratory tissues consisting of tightly adhering cells), with differential patterning across an axis—a developmental phenotype essential for the construction of complex tissue layers and the formation of a primitive gut (Maldonado 2006; Nakanishi et al. 2014).

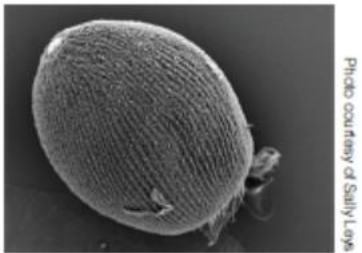
It has been proposed that the larvae of some ancient sponges (the homoscleromorphs) became sexually mature prior to metamorphosing into juveniles. This would have freed homoscleromorphs from maturation into adult form, which may have opened a door for the natural selection of tighter epithelial cell connections capable of supporting the movements of gastrulation, and ultimately the evolution of diploblastic (two-layered) metazoans such as the cnidarians (Nielsen 2008).

Figure 1

(E)



(F)



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