Studying cellular mechanisms involved in canal network morphogenesis of the jellyfish *Aurelia aurita* using fluorescent 3D+time microscopy

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Looping spatial networks are numerous in nature, but in contrast to treelike networks their morphogenesis, how the loops emerge, is less studied. Examples of looping networks include many biological networks: vascular networks in animals, plants and mushrooms, gorgonian coral; as well as physical networks: river deltas, ceramic cracks; or mixed, such as road networks, termites or ants nests. Here we study the morphogenesis of the looping canal network of the gastrovascular system of the jellysh, Aurelia aurita.

The canal network is 'spanned' in a sheet with stem cells called the endoderm. The endoderm is a thin flat mono-cellular layer. While the canal cells are bulky and form a 3D structure in the plane of the endoderm. New canals sprout off from the circular canal after which they grow and finally establish the loop by connecting to an older already existing canal. The dynamics of the macroscopic growth of the network is shown in the figure.

Using 3D + time fluorescent confocal microscopy we would like to study the cellular morphogenetic processes for network formation in a jellyfish larva. The questions we will try address during this internship are:

1. Do the new canal cells arise from the endodermal stem cells or do the canal cells proliferate and the surrounding endodermal cells adapt around it?
2. How do the canal cells at the sprouting tip establish a connection to an already existing vessel?