Reconnections in the gastrovascular canal network of jellyfish A. aurita

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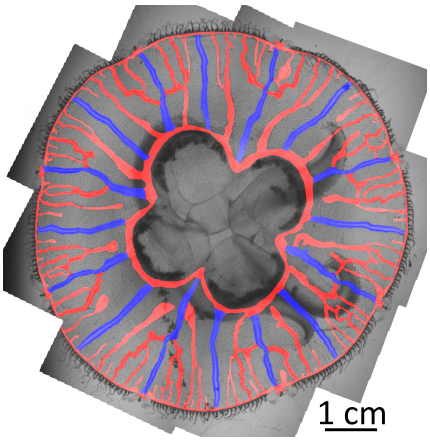

Figure 1. Jellyfish as seen from the bottom with highlighted canals composing its gastrovascular system

Jellyfish gastrovascular system (Fig. 1) consists of channels through which seawater flows carrying nutrients and oxygen. As the jellyfish grows, new channels grow from the outer rim of its umbrella and develop towards the stomach. These channels form a quasi two-dimensional network, the dynamics of which are our main focus. Due to the ease of growing genetically identical jellyfish and observing them *in vivo* they make a perfect system to study different physical parameters on the morphogenesis in biological systems.

Usually, modeling of spatial network dynamics includes the elongation of branches, their splitting (to create a ramified network), and events of reconnection between branches (creating closed loops in a network). One can consider the emergence of a network as a result of one phase invading another with a diffusive field driving it – so-called Laplacian growth (viscous fingering patterns, river networks, blood vessel networks). In such a case, it was shown that taking into account a finite mobility ratio between the two phases can lead to reconnections [1]. Attraction between branches is even more prominent when one of them reaches boundary of the system (break-through). The reconnections after break-through were observed in many physical systems (fracture dissolution, viscous fingering, lightnings), as well as in jellyfish. This indicates that the physical mechanism underlying the growth of the canals might be described similarly to the other Laplacian growth systems.

References

1. A. Budek *et al.*, *PR E*, **96(4)**, 042218, (2017)