



## Pumping for life in the ocean - sealless sponges

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**Pumping for life in the ocean - sealless sponges<sup>1</sup>** JENS HONORE WALTHER, SEYED SAEED ASADZADEH, THOMAS KIRBOE, POUL SCHEEL LARSEN, Technical University of Denmark, SALLY P. LEYS, University of Alberta, GITAI YAHIEL, Ruppin Academic Center — Sponges in the ocean are suspension feeders that filter vast amounts of water. Pumping is carried out by flagellated chambers that are connected to an inhalant and exhalant canal system. In "leucon" sponges with relatively high-pressure resistance due to a complex canal system, pumping is only possible owing to the presence of a sealing, gasket-like solid structure (forming a canopy above the collar filters) that also forces the inflow through the collar filter ensuring efficient filtration of prey particles. Here we combine numerical and experimental work, and demonstrate how sponges that lack such sealing elements, e.g., calcareous sponges, are able to efficiently pump and force water through their collar filter, thanks to the formation of a "hydrodynamic gasket" above the collar. The position of this hydrodynamic gasket is determined by hydrodynamic interactions between the part of the flagellum confined inside the filter and the part extending beyond and the pressure resistance of the canal system. Our findings link the architecture of flagellated chambers to that of canal system, and lend support to the current view that the sponge aquiferous system evolved from an open-type filtration system, and that the first metazoans were filter feeders.

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