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No flows in vein: blood, oxygen, and pumping - oh my!

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From heart tubes to respiratory breathing, many organisms use valveless pumping mechanisms for internal flow transport. These pumping mechanisms were first seen in basal chordates, e.g., tunicates, where the drove through through their open circulatory systems. As evolution took its course these pumping techniques begun to be found in insect hearts and during first stage of vertebrate heart development, when the heart is nothing more than a valveless tube. However, valveless pumping is not unique to only circulatory systems; some anthropods, such pycnogonids (sea spiders) use it for respiratory purposes as well. In this talk we will use fully-coupled fluid-structure interaction models to explore various valveless pumping techniques and their implications for internal flows produced across a variety of organisms and biological scales.

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