

Abstract Submitted
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Emergent circulation in the loopy network of bird lungs¹ QUYNH NGUYEN, New York Univ NYU, ANAND OZA, New Jersey Institute of Technology, JOANNA ABOUEZZI, GUANHUA SUN, STEPHEN CHILDRESS, New York Univ NYU, CHRISTINA FREDERICK, New Jersey Institute of Technology, LEIF RISTROPH, New York Univ NYU — The airflow in our lungs oscillates as we breathe in and out, but not so for birds. While mammalian lungs are branched and tree-like, bird lungs have loopy airways that display directed flows throughout the breathing cycle. How the air is pumped and directed without valves remains an open problem. Using lab experiments and simulations, we show that these unusual flow patterns naturally emerge within networks containing loops. Oscillatory flow imposed in one segment of a multiloop network is transformed into directed flows along other segments. Network topology and complex flows at junctions play subtle roles in this new form of flow rectification, AC-to-DC conversion or valveless pumping.

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