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Blood flow and wall motion in an idealized left ventricle[1] STAVROS TAVOULARIS, MATTHEW DOYLE, YVES BOURGAULT, University of Ottawa — During diastole of the heart, the left ventricle (LV) expands as a result of both incoming blood flow and wall material relaxation. In this work, we simulate both of these effects, along with the fluid-structure interaction between the blood and the heart wall. As a first step leading to more realistic studies, we approximate the LV by a prolate ellipsoid and the valves by cylindrical tubes. The mitral valve is open, allowing blood to enter the LV, whereas the aortic valve is closed. To account for the effects of muscle fibers in the heart wall, we model the wall as a multi-layered orthotropic linear elastic material with different material properties in the fiber, sheet, and sheet-normal directions within each layer. Results will be presented for this idealized configuration, while simulations of blood flow in realistic canine left and right ventricles are currently underway.

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Stavros Tavoularis
University of Ottawa

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