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In vivo measurement of blood flow in the vitelline network CHRISTIAN POELMA, PETER VENNEMANN, RALPH LINDKEN, JERRY WESTERWEEL, Delft University of Technology — The growth and adaptation of blood vessels is studied *in vivo* in the so-called vitelline network of a chick embryo. The vitelline network, a system of extra-embryonic blood vessels that transports nutrients from the yolk sac to the chick embryo, is an easily accessible model system for the study of human cardiovascular development and functioning. We present measurements obtained by means of scanning microscopic Particle Image Velocimetry. Using phase-locking, we can reconstruct the full three-dimensional flow as a function of the cardiac cycle. Typical reconstructed volumes are $0.4\times0.5\times0.2$ mm^3 with a spatial resolution (i.e. vector spacing) of 6 μm. These hemodynamic measurements allow a study of the coupling between form and functioning of the blood vessels. Special attention is given to the local wall shear stress (WSS), an important physiological parameter that is thought to determine - to great extent - the adaptation of the vessels to changing conditions. The WSS can be estimated directly from the velocity gradient at the wall or from a fit to the blood velocity profile. The former method slightly underestimates the WSS (most likely due to lack of resolution) but is significantly easier to apply in the complex geometries under consideration.

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