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Hydrostatics, steady flow, and dynamics in helically-supported capillary channels[1] DAVID THIESSEN, JERRY OELERICH, KELSEY CLINE, LIKUN ZHANG, Washington State University — Helically-supported capillary channels consisting of water-filled, slightly stretched, horizontal springs constitute an ideal system for the study of the hydrostatics and hydrodynamics of capillary channels. This unique geometry allows for sub-micron measurement of the radial position of the meniscus as a function of axial distance down the channel using digital image analysis. Hydrostatic measurements on a 300 micron diameter channel, with a length-to-diameter ratio of 120, give a profile of channel compliance as a function of axial position. Capillary-driven flow in this channel has been demonstrated at flow rates up to 0.8 mL/min (average axial velocity 0.25 m/s). The flow rate limits in these channels are understood in terms of capillary pressure limits. Larger diameter channels (3 mm) connected to a pressure reservoir are being studied for application to microgravity phase separation. In this case, the channel diagnostics are used to examine droplet impact and absorption into the channel as well as for the detection of capillary waves that emanate from the impact point.

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