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Transverse migration of polyelectrolytes in microfluidic channels: Concentrating and purifying DNA[1] ANTHONY LADD, BENJAMIN VALLEY, JASON BUTLER, University of Florida — I will describe recent experiments where DNA is injected into a microfluidic channel and convected through the device by a pressure driven flow, while simultaneously being subjected to an opposing electric field. Epifluorescent and confocal microscopy have previously shown that DNA then migrates to the walls of a microfluidic channel. An interesting consequence is that DNA rapidly accumulates at the junction of two channels of significantly different width, suggesting a possible means to both concentrate and purify DNA. Unlike a number of electrokinetic-based separations, trapping of DNA does not depend on complex flows or fields. Rather, it exploits a little studied aspect of flexible polyelectrolytes; namely that an electric field can generate a long-range flow around an elongated molecule, stretched (for example) by a shear flow. This leads to novel length-dependent motions of the polymer and in particular migration perpendicular to the flow. Because transverse migration is specific to flexible charged molecules and does not depend on the solvent properties, it is specific to nucleic acids among other biological molecules. Recent experiments show a high degree of purification of DNA from solutions containing large amounts of protein, without requiring additional reagents.

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Anthony Ladd
University of Florida

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